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* *Note to Binder.*—These are to be bound to follow the last number in the volume of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

Original Communications.

PHENOLOLIPOID N. IN EXPERIMENTAL INFECTION BY *MICROCOCCUS MELITENSIS*. (CHEMOTHERAPIC NOTES.)

By Dr. Alfredo Carini.
Assistant.

(From the Institute of General Clinical Medicine of the University of Palermo, directed by Professor Liborio Giuffre.)

We owe the first attempts on serum treatment of Mediterranean fever to Wright in 1895, which were followed in 1905 by the researches of Eyre from which came many interesting studies, but the serum obtained from the usual laboratory animals in practice did not possess sufficient curative properties.

Later Trambusti, on taking up the subject again, instead of having recourse like his predecessors to dead or living cultures of *Micrococcus melitensis*, used nucleoproteid extracted according to the method of Lustig and Galeotti, but in practice the results again were not always satisfactory.

Afterwards, when Ehrlich with his works gave the foundation to modern chemotherapy, in this new field a series of experiments was made which have acquired great interest both scientifically and practically.

Wright on one hand, and Morgenroth and his school on the other, tried the action of several alkaloids of the quinine series in experimental infection by pneumococcus; Neufeld, Roos, Bierbaum, and Schiemann used arsenical compounds, including salvarsan, in experimental infection of hæmatic carbuncle; Conradi used chloroform in typhoid infection; Izar tried compounds of the quinine series in infection by *M. melitensis;* lately Tallo, in infection by Bruce's micrococcus used several arsenical compounds (atoxi-arsacetina) which as chemotherapic agents proved fairly efficacious.

However, in the chemotherapic experiments made up to the present, the above-mentioned authors have only studied more particularly the question of combating the infective agent, leaving out of their calculations another very important element, that is to say, the bacterial toxins, both exo- and endotoxins.

And since in bacterial infection the danger to the infected organism does not arise so much from the bacteria themselves as from the toxins which they secrete or which they set free with the dissolution of their bodies, it is necessary to use a substance which has both an antibacterial and an antitoxic action.

Exactly following this idea I have made a series of experiments with Piazza's phenololipoid N., which is supposed to have exactly this double antibacterial and antitoxic power. I tried its effect in infection from *M. melitensis* which, as is well known, causes profound alterations in the infected organism by means of the exotoxins (according to Trambusti, however, chiefly by means of the endotoxins).

Technique Used.

For experiments *in vitro* I used the following technique:—

Having prepared in a series of test-tubes sterilized dilutions in olive oil (4 c.c.) of phenololipoid N. so as to give gradually decreasing dilutions from 1/10 down to 1/100,000, I inoculated in each tube the same quantity (four drops) of broth-culture of *M. melitensis* obtained after incubation in thermostat at 37° C. for seventy-two hours.

Having shaken the tubes well in order to obtain a homogeneous emulsion I took a sample with a standard loop and inoculated it both in broth and agar with glycerine. The taking of the samples and the inoculation in the culture preparations was made after a definite time in contact (with the temperature at 18° to 20° C.) with the bacteria with the phenololipoid solution, that is to say, after 15 minutes, 30 minutes, 1, 2, 4, 6, 12, 24 hours; the inoculations which were placed in a thermostat at 37° C. were controlled by me during ten consecutive days.

Before taking samples I was always careful to shake the tubes in order to render the emulsion perfectly homogeneous; the culture preparations were broth and agar broth with glycerine. I have never failed to make controls.

The results obtained are collected in a large number of tables which will be published at a future date.

For the experiments *in vivo* the strain of *M. melitensis* which I used (and which was the same as that used for the experiments *in vitro*) was isolated from the blood circulating in a patient suffering from Mediterranean fever, subsequently cultivated artificially and passed several times through an animal. I always used seventy-two-hour glycerine agar cultures, inoculating into the peritoneum the same quantity of material, that is, four emulsioned loops in a sterile physiological solution, a quantity of virus amounting to a lethal dose; the animals which I used were guinea-pigs. All died on an average of five days after inoculation.

After having determined the maximum dose of phenololipoid N. tolerated by healthy animals, I used a 10 per cent. solution in oil, inoculating a cubic centimetre subcutaneously daily, which corresponds to 10 cg., which is much less than a lethal dose.

I made two series of experiments: in the first one I treated the animals with two subcutaneous injections per day (morning and evening) of ½ c.c. each; in the second one only one subcutaneous injection of 1 c.c. per day.

Conclusions.

The result of the experiments is that the *M. melitensis, in vitro*, reacts to phenololipoid N. more or less intensely according to the length of time that it is exposed to its influence and to the strength of the solution; in dilutions from 1/10 to 1/20 there was a complete absence of development even after only fifteen minutes' contact; even with

dilutions down to 1/1,000 there was a remarkable result as regards the bacteria-destroying effect.

We may, therefore, infer that phenololipoid N. acts *in vitro* on the vitality of Bruce's micrococcus, first weakening it and then killing it.

The results of the experiments *in vivo* can be thus resumed:—

(1) The animal, on which the experiment is being made, after inoculation of the virus shows febrile reaction which sometimes reaches 40·5° C. The fever is of the continued type, and the animal dies in a period which varies from three to eight days. From blood taken aseptically from its heart it has always been possible to isolate *M. melitensis*.

(2) Animals treated with phenololipoid N. after the infection was completely developed: nearly all survived.

(3) After inoculation of phenololipoid N. there was invariably a constant lowering of the fever, often down to normal, an hour after the injection. The animal treated in this way had its usual appetite and liveliness.

After an average of eight days of such treatment the animals were completely cured of the fever and appeared to be in perfect health, increasing in weight.

In the five animals which died after complications the hæmoculture was always negative.

We may therefore infer that in experimental infections with *M. melitensis*, phenololipoid N. given daily subcutaneously shows energetic antibacterial and antitoxic properties, and saves the life of the infected animal.

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PROGRESS REPORT ON THE TREATMENT OF LEPROSY BY THE INTRAVENOUS INJECTION OF CHAULMOOGRA OIL.

By Philip Harper.

Medical Superintendent, Makogai Asylum.

Nomenclature.

In my opinion (elsewhere expressed) all cases of nodular leprosy, if carefully examined, will be found to present symptoms of affection of the peripheral nerves, and therefore I consider that there is no such condition as pure nodular leprosy. The term "nodular leprosy" is, however, convenient for descriptive purposes.

At Makogai Asylum (Fiji) over two hundred cases are undergoing teatment by intravenous injection of chaulmoogra oil. These include a child of 4 years of age and a European of 70 years. Since the treatment was started over twenty-six thousand injections of chaulmoogra oil have been given intravenously. No serious ill-effects have occurred, but there have been two subcutaneous abscesses (due to faulty injection), which rapidly yielded to ordinary treatment.

Patients vary considerably in the dose tolerated, and therefore the dose must be carefully adjusted to each patient. The temperature chart alone is no guide to dosage.

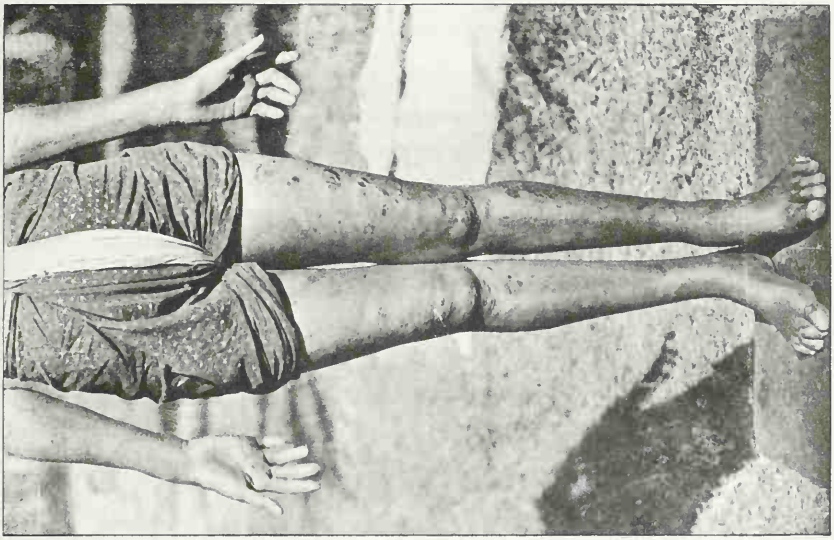
"Treatment reaction" may consist of tachycardia, fever, and a blotchy, red, raised eruption, sometimes accompanied by swelling of nodules and infiltrations, which are then completely or partially absorbed. This is a favourable episode, but it is sometimes difficult to distinguish from true leprotic fever, in which with each outbreak of fever the nodules enlarge or new nodules or infiltrations appear. In difficult cases the distinction between the two conditions may be impossible until the symptoms begin to abate. Then there is no doubt; *vide* photos of Case 30 in attached list, the photos showing her condition immediately before and immediately after a treatment reaction lasting over three weeks.

Patients are seldom very ill with "treatment reaction," nor as a rule do their nodules ulcerate, though such may sometimes occur. Quinine and digitalis are of very great assistance in controlling the raction.

Most cases improve without a treatment reaction severe enough to be noticed, e.g., Case 13, who was accustomed to fairly severe bouts of true leprotic fever with swelling of his nodules, has since the start of his treatment had no noticeable fever, but has gradually lost his nodules, the bacilli in which were at first bright red and uniform to carbolfuchsin, but gradually became beaded, and are now represented by a little acid-fast granular detritus.

Thirty-eight cases have now been under treatment for periods of up to eleven months. They are a fair sample of the general population of an asylum in which patients are rigidly kept till cure or death, and therefore my results cannot be compared with those from any treatment in which there is a selection of cases most favourable for treatment.

One patient died during the course of her treatment. The cause of her death was acute pleuropneumonia during an epidemic of influenza in which there were three other cases of pneumonia. Before she was attacked I had stopped all injections of oil for eleven days because of the epidemic. She was doing well until the epidemic. I do not consider her pleuro pneumonia to have been influenced adversely by the injections. The date of her death was April 27. The steamer *St. George*, previously



Case No. 30 immediately after subsidence of treatment reaction.

Case No. 30 before treatment reaction.

To illustrate "Progress Report on the Treatment of Leprosy by the Intravenous Injection of Chaulmoogra Oil," by PHILIP HARPER.

Serial number of case	Date of commencement of treatment	Condition at commencement of treatment	Condition at date of report (July 17, 1921)	Number of injections given	Amount of Chaulmoogra oil given		
	1920				Oz.	Fluid drm.	min.
1	Aug. 24	Very advanced and progressive nodular leprosy; pharyngeal and larvngeal ulceration, nodules in irides, corneæ and all over skin	Has continued to get worse, but not more rapidly than before	130	4	5	37
2	,,	Very advanced nodular, marked nodular and nerve deformity	Much improved general health, nodules perhaps smaller	206	5	1	31
3	,,	Advanced nodular with nodular and nerve deformity	Improved	212	5	1	53
4	,,	Very advanced nodular with nodular and nerve deformity	No noticeable change	202	5	0	10
5	,,	Very advanced nodular, nodules in skin, irides, and mucous membranes, deformities	Lesions have advanced	193	4	5	34
6	Nov. 8	Very advanced nodular: lepra en cuirasse	General health improved, leprotic fever abolished, local lesions unchanged	165	4	0	37
7	Aug. 30	Very advanced nodular leprosy, deformities... ..	Improved	220	5	3	27
8	Sept. 7	Nerve and commencing nodular leprosy, lepra bacilli in nasal smear	Improvement includes disappearance of bacilli from nose, and regrowth of hair	225	5	5	44
9	,,	Nerve and nodular leprosy, definitely advancing ...	General health improved, no advance in symptoms	192	4	6	6
10	Sept. 6	Stationary nerve leprosy, raised decolorized patches	Flattening of patches	202	5	0	6
11	Sept. 13	Advanced nodular leprosy	Improved	221	5	1	14
12	,,	Advanced nodular with nerve deformities	Improved	208	5	0	54
13	,,	Nodular leprosy	Apparent cure	222	5	2	47
14	,,	Advanced nodular leprosy	Improved	208	4	5	25
15	,,	Nerve symptoms had cleared leaving persistent lepra bacilli in nasal mucus	Apparent cure	221	5	1	39
16	,,	Nodular leprosy	Improved general health	198	4	6	59
17	,,	Mild nerve case passing to nodular	Improvement	216	5	0	44
18	,,	Advanced nodular	Improved	217	5	1	52
19	,,	Steady progressive nerve case becoming nodular ...	Much improved	218	5	2	7
20	Sept. 20	Nodular: tuberculosis of lungs	No definite change	155	4	2	38
21	Sept. 21	Nodular leprosy	Very great improvement	215	5	1	37
22	Sept. 27	Advanced nerve and early nodular leprosy	Unchanged	207	5	0	12
23	Oct. 4	Nerve leprosy	Improvement	200	4	7	4
24	,,	Rapidly progressive nerve leprosy turning to nodular leprosy	Worse	177	4	4	25
25	Oct. 10	Advanced nodular with nerve deformities and pulmonary tuberculosis	Great improvement...	154	4	2	1
26	,,	Advanced nodular with great nerve deformaties ...	Much improved	192	4	4	54
27	,,	Nerve leprosy	Much improved	178	4	2	55
28	,,	Advanced nodular: much improved after years of intramuscular chaulmoogra oil: since stationary	Unchanged	184	4	3	50
29	Oct. 25	Early nodular: 5 years of age	Much improved	185	3	2	9
30	,,	Advanced nodular	Very great improvement	170	4	0	1
31	,,	Nerve leprosy	Improved	166	4	0	45
32	,,	Advanced nodular leprosy with nerve deformities ...	Much improved	185	4	4	37
33	,,	Nerve leprosy	Improved	156	4	0	32
34	,,	Nerve leprosy	No change	160	4	0	24
35	Nov. 17	Advanced nerve leprosy	No change	143	3	6	15
36	,,	Advanced nerve leprosy	Much improved	143	3	6	20
37	Nov. 23	Nodular leprosy	Improved	130	3	6	10
38	Nov. 8	Very advanced nodular leprosy: aged 9 years ...	Died during an influenza epidemic, after steady improvement under treatment, cause of death being	150	2	4	54

healthy, left here on June 5, at the end of our epidemic, and was immediately on arrival in Sydney quarantined for very severe influenza, ten of the ship's crew being removed at once to an isolation hospital.

Of the thirty-eight cases of leprosy listed below twenty-eight have improved (over 70 per cent.), one as above related died of influenza, three have definitely got worse, and in six I can see no change.

In my opinion Cases 1, 5 and 24 would have been likely to get worse if treated by any other method known to me. Case 15 owes his cure partly to local treatment of his nasal condition. He had atrophic rhinitis with ozæna, for which he had his nose regularly syringed and packed. Many years of local treatment had been unsuccessful until supplemented by intravenous injections of chaulmoogra oil.

Finally, it is my opinion that many of these cases would have improved under treatment by other modern methods, but I believe that my treatment is safer, more effective, and less painful.

NOTES ON A PECULIAR TYPE OF EPIDEMIC DERMATITIS.

By Osborne Browne, M.D.Edin.

I wish to draw attention to an apparently unrecognized disease, which has recently been, and still is, prevalent in British Honduras. None of the text-books on tropical diseases, including Castellani and Chalmers', throw any light on the subject. I fell a victim to it myself, as did the other members of my household, so I can speak with authority.

Where it came from into the colony can only be surmised. In my twenty-three years' experience of disease here I have never seen anything like it. It has only come to my notice since the troops returned from Mesopotamia and Egypt, so it may have been introduced here by these men.

It is very contagious, but some appear to be immune, although closely associated with the infected. For instance, a mother may escape, although the child she nurses be covered by the disease from head to foot. Of a couple living together, one may be infected and the other escape. Frequently in a family some of the members may escape. On the other hand, it is not unusual to find every member of a household affected. Some, again, do not suffer to the same extent as others, and in some the disease expends itself in three or four months, while in others it may continue as long as two years, and possibly longer. Sometimes it appears to come to an abrupt termination, but more often it fritters out with occasional exacerbations. The *incubation period* appears to be about one to two months.

Practically all the *symptoms* are cutaneous. There may be lassitude, vague joint pains and some hepatic congestion. The general health may deteriorate, with perhaps a loss of weight of 10, 14, or 18 lb. In some males there is a loss of sexual power. A considerable deposit of triple phosphates may occur in the urine for a time. In the case of two infants who died there were symptoms of intestinal disturbance, but of itself insufficient to cause death.

The *onset* is, as a rule, abrupt. Within a few moments *severe itching* occurs usually on the abdomen or buttocks, and a *rash like "hives" urticaria* makes its appearance. Many of these "hives" become *papular. Granulomata* of the size of a small bean or marble, in most of the cases I have seen, form in the deeper layers of the skin. The *pruritus is intense*, especially at night. The pruritus is also peculiar at times, and feels *like something "swarming"* in the skin. There is also at times considerable *formication* or biting, causing the patient to hunt about for ants or fleas, but the formication travels too rapidly to be insect in origin. At times there is a feeling like cobwebs on the face. Tearing away the scab from a papule eases the irritation till a new scab forms.

There is no tendency for the individual papules to spread, but each, after itching, scaling and persisting for perhaps months, dies away gradually, being succeeded by fresh eruptions. The skin, especially if dark, is left in a piebald unsightly condition, with either darker or lighter spots. Fortunately, however, these marks gradually wear away, except in lesions that have by scratching become deeper than usual.

No portion of the skin is exempt—from the crown to the soles of the feet. Even the *palms, soles* and *glans penis* may be affected. The eruption has a way of skipping about, dying down on one part and suddenly appearing on another. For instance, it may lessen on the legs and appear more on the arms, or in an hour or two the whole back may become covered with itching "hives," many becoming *papules*. It very often appears on the fingers and webs of the fingers, simulating scabies in appearance. Here, as well as elsewhere, *vesicles* may form, and these sometimes become *purulent*. The buttocks, genitals, abdomen and legs may be covered with *purulent papules* with pain. When such pustulation occurs the itching at that part subsides. At times there may be considerable itch of parts of the skin without visible lesions.

The skin not only may present "*hives*," *papules, vesicles* and *pustules*, but minute *plaques* may occur on the backs of the hands and elsewhere. These persist a very long time, but usually do not itch. *Whitlows* may form, and I have known cases of young children where the nails suppurated off. Sometimes considerable areas are *rough like sandpaper due to minute papules*, or show a *furfuraceous desquamation. Indeed, more or less exfoliation of the superficial layers of the skin with or without pruritus is a very predominant feature of the disease all through its course*. Also at times *roseolar rashes* appear, especially on the chest. These can appear quite suddenly, and after lasting a few hours fade away, to come again next day. These rashes are very itching or sometimes burning, and are made worse by mental excitement and sweating. The

hair also gets cut off at the base by all this *dermatitis*, and may be shed so plentifully as to leave the part smooth and bare, but it grows again.

The symptoms may last only three or four months, but usually they last very much longer, subsiding, even altogether disappearing at times, only to break out again. They gradually lessen in severity until a bite here and there or small outcrops of small itching papules and "hives" (especially if the weather is hot and sultry) is all that remains.

I have seen fairly extensive rashes even after a duration of two years. These are especially liable to occur when the body is fatigued or during hot, sultry weather. Although exertion and sweating or excitement of any kind may cause an exacerbation, field labourers often say that it does not annoy them so much when they are sweating profusely, but only when they come home and begin to cool down.

I have only known of two deaths in which I believe the disease was a contributing cause. Both were infants, who also had symptoms of bowel trouble, especially tympanites. This bowel derangement may or may not have been a symptom of the disease. This year there are a good many persons with ulcers in which a history of "the itch," as it is called, can be obtained. When the symptoms are acute only the softest old under suits can be worn. The severe pruritus over such a long time with night after night of disturbed rest is enough to break down even a strong constitution and make it more liable to malaria and other infections.

Treatment is very unsatisfactory, and usually the most that can be done is to relieve symptoms. The natives use large quantities of sulphur ointment and sheep dip. I have used Vleminck's solution, strong iodine tincture, lotion biniodide of mercury, carbolic lotion, germicidal soap (Parke, Davis and Co.), menthol lotion, emollientine, mercurial ointments. Internally I have used iodides, protoiodide of mercury, even intravenous injections of neoarsenobenzol and aspirin to soothe the nervous system. Of all these I have derived most benefit from iodides and mercurials both externally and internally. Ordinary borated talcum is very useful, especially on the roseolar rashes. As regards baths, there is a difference of opinion amongst the sufferers. Hot alkaline baths may at first be soothing and later become irritating. Cold baths are soothing to some, and in others may cause a profuse urticarial rash. Eventually even tepid baths may cause irritation, and a peculiar thing I noticed after the bath was a swollen and irritable condition of the glans penis.

What is the infection? I examined scales and scrapings until I was tired; then I pulled the scab off a papule, squeezed out a little serum, made a film, fixed and stained with Giemsa, and then on examination with 1/12th objective found numerous reticulated clumps and chains of micrococci.

Is this micrococcus then the cause? I had previously thought it was some spirillum, and purposely stained with Giemsa a long time in the hope of finding spirilla, as I have only a Ross folding microscope and a few stains, but no dark field apparatus.

At all events, it appears to me that the infection is not necessarily conveyed by insect agency of any kind. About two months after I got infected every other member of my household became infected *simultaneously*. It was the dry season at the time and few mosquitoes were about. At all events, I saw and felt none in my house. There might have been one or two fleas knocking about (as there is apt to be in dry weather), but nothing to speak of.

That it is a skin disease of a parasitical nature is counted out at once by consideration of the course and symptoms. It is certainly not scabies, nor is it a mycosis. Its very resistance to the most prolonged and drastic local treatment proves it neither scabies, pemphigus, nor a mycosis apart from other considerations. Its whole symptomatology goes to prove it to be a general infection, and it is long lasting, possibly because this general infection does not produce a febrile reaction on which a quick immunity would be founded.

Trusting my few remarks on this apparently unrecognized clinical entity may be welcome.

Proposals for Anti-malaria Work in Palestine (Dr. Hillel Yofe, *International Journal of Public Health*, vol. xi, No. 5, September-October, 1921).—An anti-malaria service should be established in Galilee with offices for engineering and for sanitary research. Minor measures should immediately be put in practice, beginning with quinine prophylaxis, and the use of larvicides in the various regions where malaria is most serious. As soon as the appropriate investigations of engineers and health officers are completed and a practical scheme for sanitation has been drawn up, a contract would be made for the carrying out of the scheme, account being taken of the Turkish law by which unused land of a marshy nature may be allotted to those who have drained it. A central anti-malaria office should be founded in Palestine with a medical council and the assistance of engineers and agriculturists, and with an appropriate and competent personnel. The malaria work must be distinct from the ordinary work of the department of health, having its own budget and personnel, though naturally the final control of the campagin would be the responsibility of the Government Health Department.

A Case of Oriental Sore in the Sahara (B. Bacque, *Arch. Instituts Pasteur de l'Afrique du Nord*, vol. i, No. 1, March, 1921).—The author describes a case of oriental sore contracted at the oasis of Souf. Flies are abundant in this oasis all the year round, mosquitoes appearing in small numbers during the winter and spring, and disappearing entirely during the summer. Phlebotomus, however, is very prevalent. It is not known to which of these flies the carriage of oriental sore is responsible.

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1922.

"AND now another year has gone," and with it the part for better or worse it has played. It may be truly said that the world of medicine is wiser from the experience it has brought us, and we benefit thereby; but that it has brought nothing but improvement—clinically, therapeutically, and practically—may not be the case. Wiser from the experience gained during the succeeding months of its passing is all for betterment, and if the lesson is but a negative one, a positive good is to its credit, whichever way it points. By proving the worthlessness of an adopted measure is but next in importance as a benefit to the permanent establishment for good of some collateral medicament, vaccine, inoculation or measure. Destructive criticism is a useful phase of study in other venues of knowledge than in medicine, and will ever continue to remain so. The medical practitioner, be it in tropical medicine or in the more settled ways of "home" practice, is so besieged and beset by floods of inventors, chemists and druggists, analysts, physiologists, observers, &c., and by the thunderings of bio-chemistry, with its widely opening doors, illimitable in numbers, and leading to channels and recesses of increasing intricacy, that bewilderment has been the result, and uncertainty as to which door to enter or which channel to follow. That this condition of things will remain for many a long day is certain; that out of the turmoil and the chaos that is with us good will come is doubtless; but the mind of the man whose duty it is to hold the balance level has a difficult task in hand, and requires a reserve of power in judgment which is beyond most of us.

It is said that as a doctor advances in years the range of the drugs he uses and the measures he adopts become fewer and yet fewer, until at last they are circumscribed and reduced to a few "favourites." The seniors in medicines of to-day are rather afraid to appear as "most potent, grave and reverend seniors" alongside of the young knights-errant of the hypodermic needle and the scalpel. Experience which taught wisdom to the older members of our profession is assailed ruthlessly and persistently now by statistics founded not on æons of experience, but on laboratory investigations of a few hours' duration. Scientific hustling is the order of the day, and many good things have come out of it; but false lines and paths are agape, and tend to lead the unwary and the inexperienced astray.

The doctor with the most lucrative practice in this or any other country was Dr. Jephson of Leamington whilst that English spa reigned supreme, and continental spas did not steal away the affluent from England to this or that boomed resort with its side-issues of treatment—uniformed brass bands, operas, and amusement-provided attractions which make direct medical treatment a mere insignificant appendage to spa treatment by experts, skilled in co-ordinating the whole into a balanced system calculated to produce the greatest good. Jephson's system was simple in the extreme; he had two preparations he relied upon. All febrile troubles were treated by Warburg's tincture; and all gouty affections, all gastro-intestinal, hepatic, renal and cutaneous ailments, rheumatism in its hydra multiplicity of forms, by guaiacum resin and sulphur, with iodine of potassium added in spring and autumn when syphilitic infection was in evidence. He practised but

fifteen years, when he became blind, and had to retire with well-nigh half a million pounds sterling in his possession. He believed in his drugs, he was unaltered in his plans of treatment, the mild Leamington spa water was the adjunct—the appendage in Jephson's system, and other side-issues were practically *non est*.

Warburg's tincture, the oldest of all known compounds—for it has been in use from the time of Mithriades, long before the Christian Era—is used still in India, but modern teaching has sounded its death-knell, and to the Indian student it is not mentioned by his British teacher at the medical college of his university. It is said Warburg "bought the secret of the medicine for fever" in India, added quinine to it, baptized it with his name, and afterwards sold the secret to Jephson in England. The tincture is a product of polypharmacy, if ever there was one; no less than twenty-three drugs are contained in this substance, the very antithesis of modern pharmacology, with its "one tablet one disease" ideas, "a dock and nettle" system of dosing which suits the "hustler" of to-day.

There are few Jephsons of to-day. Warburg's tincture is more or less of a curiosity; its abominable taste will not be tolerated by the modern drug taker, as he or she considers a practitioner who prescribes castor oil as an effete relic of barbarism and unfit to prescribe medicines for civilized peoples. Guaiacum is seldom used to-day; so much neglected is it that the doctor has forgotten how to spell the word, and after various attempts to write it substitutes something which he knows how to spell.

The age of the hypodermic syringe is now with us not merely for serums, &c., but, as in France, for the administration of ordinary drugs that we are accustomed to give in mixtures, pills, &c. The late Professor Blanchard told the writer that the use of the hypodermic syringe has come into practice in France in late years to an extraordinary extent. He said the French people are very "careful" in their methods. That a doctor's prescription is handed round by a patient amongst his neighbours, and instead of their going to see the doctor, take from amongst their neighbours the prescriptions that have gained the highest reputation. In this way the doctors were kept poor. Since the doctors have found the secret of the use of the syringe, Professor Blanchard says the practice of the poor French doctor has increased three-fold; and as he said, by way of a joke, the French ladies will now have their purgatives by the hypodermic syringe only.

Such is the fashion in 1922, and the doctors in France are happier.

Disease.—Of diseases, plague still holds its place, or is it *a* place? It is forgotten in a way; familiarity with the once dread disease has bred perhaps not contemnt but popular neglect. When it first appeared in Hong-kong in 1894 and Bombay in 1896, the news when it reached this country that plague was in Bombay alarmed the Government in no measured degree. Sir Joseph Fayrer, who was consulted by the India Office, referred them to the writer as one, the only one in England at the time, who had seen plague. Parliament demanded to know how soon it would be stamped out; they must know, as it was too important to be allowed to rage in that great commercial centre. When the writer was asked when he expected it to be stamped out, the answer was "this time a hundred years." "But," said the Surgeon-General, "I can't go back to Parliament and give that answer?" "Say what you please; but as doctors, it is no use camouflaging to each other. Last time it was in London it held a place amongst the returnable diseases for a century, and unless some as yet unknown means of eradicating the ailment is discovered, there is no reason to believe that it may not persist for a like period." It is over a quarter of a century since that conversation, and plague is with us still. Not that the authorities have been idle or neglectful, quite the opposite, and had it not been for the excellent organization followed in the British Empire, at home and overseas, plague would have been a scourge of proportions in comparison with which the present state of the epidemic would have seemed puny.

A review of all the epidemics during 1921 and at the present time is impossible short of an encyclopædia. What is evident is that of late years little money has been forthcoming whereby to send out expeditions to investigate outbreaks such as sleeping sickness in different parts of the overseas countries. An important expedition to Uganda and neighbourhood has lately been prevented going there from lack of funds; but the "poor" German Government has lately sent to Africa an expedition, with the permission of the British Colonial Office, whereas their own countrymen are compelled to stand aside and see the Germans favoured in their work. It is philanthropic, but scarcely patriotic.

J. Cantlie.

Annotations.

Regulation of Sugar Content of the Blood (L. Pollak, *Medizinische Klinik*, Berlin, July, 1921).—The author is of the opinion that pancreas diabetes is not the result of disturbance in carbohydrate metabolism so much as of disturbance in the function of the apparatus regulating the sugar content of the blood. This can be illustrated by the accelerated mobilization of glycogen in the liver. The sugar-producing process in the liver proceeds unchecked by the normal inhibiting influence of the physiologic blood sugar-regulating mechanism.

Heat Hyperpyrexia (J. N. McIntosh, *British Medical Journal*, June, 1920).—The author describes cases of heat stroke which occurred at Nasireyeh during 1916. A trench was dug, 16 ft.

long by 8 ft. broad and 4 ft. deep, and covered with reeds. As the cases arrived they were placed across the trench, injections of strychnine were given, 1-15 gr., and artificial respiration employed. Water was poured over the patients until the trench was full, and they were immersed except for their heads. The douching was continued until the patients regained consciousness and the temperature was fixed at 101° F., when they were removed to the hospital huts and wrapped in calico sheets which were kept constantly wet by pouring water over them. This treatment was continued until there was a fall in atmospheric temperature, usually after midnight. The day following injections of 3 gr. quinine bihydrochloride were given before it became very hot. No deaths occurred during this treatment.

Cultivation of Spirochætes (F. W. Twort, *Lancet*, October, 1921).—The author uses a substance which is stored up in the bodies of allied bacteria, such as the tubercle bacillus and *Bacillus phlei*, for the cultivation of bacteria which are usually difficult to cultivate. Spirochætes are especially difficult to cultivate. The growth of *B. phlei* is first killed by steaming and then dried, and 1 grm. is ground up with 12 c.c. of glycerin and 22 c.c. of physiologic sodium chloride solution. The substance is then autoclaved, and when cool 66 c.c. of mixed yolk and white of new-laid eggs is added. The medium is then placed in tubes, sterilized at 61° C. on three successive days, and inspissated in slopes.

Strain in Spirochætes (P. Thom, *American Journal of Syphilis*, No. 1, p. 9, 1921).—The author discusses the question of whether different types of syphilis are produced by different strains of the causative organism. He is of the opinion that there is no such thing as a "strain" in spirochætes, that individual idiosyncrasy, if properly investigated, will account for all the seeming vagaries of the disease. For instance, the selective action of the *Spirochæta pallida* when introduced into the body is governed entirely by the manner in which the tissues of the host react to the invader.

Industrial Dermatoses amongst Printers (W. J. McConnell, *U.S. Public Health Report*, May, 1921).—A disease common among printers is ink poisoning, which mostly affects the arms and hands. The condition is usually attributed to substitutes for or adulterants in the oil of turpentine which is used for cleaning purposes. The ink itself does not cause any irritation, but the harsh methods used to remove the ink stains. The parts are first washed in a mineral oil, then soap and hot water are used with pumice stone, fine sand, or a stiff brush. Examination showed that the trouble was more frequent and severe in patients with dry skins. Prevention of the dermatosis is possible by applying lanolin to the parts before going to work. At lunch time wash in a mixture of green soap, sawdust and water, then apply lanolin again.

A Case of Kala-azar contracted in Macedonia (P. Carnot and E. Libert, *Bull. et Mém. Soc. Méd. Hôpit. de Paris*, vol. xiv, No. 24, July, 1921).—The authors describe a case of kala-azar in a patient in Paris which had been contracted in Macedonia two and a half years previously. The complaint was never suspected, but puncture of the spleen revealed the characteristie parasites. The case ended fatally, as owing to the patient's reduced condition he did not react properly to the injections of tartar emetic.

Oriental Sore (G. F. Duckworth, *Practitioner*, vol. cvi, No 5, May, 1921).—The author describes a treatment which he found efficacious in Mesopotamia. The scab of the ulcer is removed, and a piece of lint the same size as the ulcer is soaked in a solution of urotropine (1 dr. to the ounce of distilled water) and placed on the sore. This is applied twice a day until healing has taken place.

Notes on Oriental Sores (M. L. Treston, *Lancet*, August, 1921, p. 270).—The author gives several treatments for oriental sores in different stages. He suggests X-ray applications and crystals of potassium permanganate for early stages of the sore; crystals of potassium permanganate and intravenous injections of tartar emetic for fairly advanced cases; thorough scraping under chloroform and *ol. ricini* dressings for very advanced stages, and intravenous injections of tartar emetic for sores on the face other than those in very early stages.

Blood Examinations in Infantile Kala-azar (L. Mazzoni, *Pediatria*, vol. xxix, No. 8, April, 1921).—The author made an examination of the effect of the administration of adrenalin in the blood of cases of infantile kala-azar. In blood taken half an hour after an injection of adrenalin the parasites were present in greater numbers than they were before. The increase, however, was hardly sufficient to justify the procedure as a means of diagnosis.

The injection was followed by a leucocytosis, which in rare cases results in the number of the white cells being doubled. This leucocytosis, however, is only transitory, for it disappears in an hour to be followed by a leucopænia.

Studies on the Tuberculin Reaction and on Specific Hypersensitiveness in Bacterial Infection (Hans Zinsser, M.D., *Journal of Experimental Medicine*, No. 5, vol. xxxiv, November, 1921).—In guineapigs two fundamentally different types of intradermal reactions may be observed. One of these is the immediate, transitory reaction which develops in animals sensitized against proteins (horse serum, &c.), and may be regarded as one of the manifestations of general protein hypersensitiveness, or anaphylaxis; the other is the tuberculin type of skin reaction which develops more slowly, leads to

a more profound injury of the tissues, and is independent of anaphylaxis as ordinarily conceived.

The tuberculin type of hypersensitiveness (as well as probably the typhoidin, mallein, abortin reactions, &c.,) does not develop at all in guinea-pigs sensitized with proteins, like horse serum, &c. While this form of hypersensitiveness may eventually be induced with materials not bacterial in origin, it has been observed up to date only as a reaction of bacterial infection.

Methods of treatment with protein material from bacterial cultures which sensitize guinea-pigs to anaphylactic reactions with the bacterial extracts do not sensitize them to the tuberculin type of reaction. Such sensitization is easily accomplished only by infecting the animals with living organisms. No reliable method of sensitizing guinea-pigs to such reactions with dead bacterial material has as yet been worked out, though a few hopeful experiments have been obtained with massive injections of large amounts of the acid-precipitable substances (nucleoproteins?) from bacterial extracts.

In animals made hypersensitive to the tuberculin type of reaction by infection with living bacteria, the reaction may be elicited by intradermal injections of bacterial extracts from which all coagulable proteins, nucleoproteins, and Bence-Jones proteins have been removed, as well as this can be done by boiling with acid, &c. This proteose residue alone suffices to elicit such reactions. The exact chemical nature of the so-called proteose residue must be further studied and analysed when there is an opportunity of producing bacterial extracts in large quantity.

Tertiary Lesions of Yaws in the Tanganyika Region (R. van Nitsen, *Ann. Soc. Belge de Med. Trop.*, Brussels, vol. i, No. 1, November, 1920).—The author gives the results of a study of 699 patients with yaws in most of whom tertiary lesions appeared. The tertiary period chiefly took the form of ulceration, usually attacking the trunk and limbs where the course is serpiginous. When the nose, fingers, toes, penis, lips and soft palate are attacked the mutilation may be serious, and in the extreme cases the condition is that of gangosa articular, and bone lesions are often present as well. The tertiary period begins either towards the end of the secondary or ten to twenty-five years later.

Bone and Joint Lesions of Yaws with X-ray Findings (H. G. Maul, *Philippine Journal of Science*, vol. xiii, No. 2).—The majority of cases of yaws with bone and joint involvement shows characteristic X-ray lesions. The radiograph can be used as an additional means of differentiating yaws from syphilis, when there is involvement of the bone, and as a confirmation of the evidence that the two diseases are distinct. The pains complained of in the joints are due mostly to the presence of the lesions on the articular surfaces. Twenty per cent. of yaws patients develop bone or joint lesions when not treated.

Regeneration of the bone is complete at the site of the lesion if the destruction has not been too great. The Castellani treatment causes a gradual disappearance of the bone and joint lesions. Salvarsan is a specific in these cases, and rapid regeneration of bone follows its use.

Observations on Yellow Fever in Africa (Juan Guiteras, *Sanidas y Beneficencia*, vol. xxv, Nos: 1-3, 1921).—The author describes the work of the Commission sent to West Africa to study yellow fever. No cases of yellow fever were found at all, the last epidemic having occurred in 1912. As regards the organism isolated from yellow fever by Noguchi, and supposed to be the causative agent, the author doubts whether there is any ætiological connection between it (*Leptospira icteroides*) and yellow fever. He argues that if animals were as susceptible to yellow fever as they are to the leptospira, then the disease would occur as an epizootic amongst animals during yellow fever outbreaks, it would also be very difficult to eradicate. Noguchi's organism is with difficulty transmitted to animals by stegomyia; the lesions produced by the injection of the organism differ from those of yellow fever. Dr. Lebredo was not able to transmit virus to guinea-pigs from twenty-five cases of yellow fever.

Behaviour of the Heart in Experimental Infection of Guinea-pigs and Monkeys with Leptospira icteroides and Leptospira ictero-hæmorrhagiæ (A. E. Cohn and H. Noguchi, *Journal of Experimental Medicine*, June 1, 1921).—Slowing of the heart occurred in monkeys and guinea-pigs to *Leptospira icteroides*. A similar reaction took place in animals inoculated with *L. ictero-hæmorrhagiæ*.

The mechanism of slowing was usually due to slowing of the whole heart.

The Sachs-Georgi Reaction in Yaws (O. L. E. de Raadt, *Geneesk. Tijdschr. v. Nederl.-Indie*, vol. lx, No. 2, 1920).—The author is of the opinion that the serum reaction of Sachs-Georgi gave a positive result in the great majority of cases of *Frambœsia tropica*, and may therefore be regarded as a sensitive test for this disease, even in cases apparently cured.

Yaws in the Cameroons (Hallenberger, *Beihefte z. Arch. f. Schiffs u. Trop. Hyg.*, vol. xx, No. 3).—The author emphasizes the difficulty of diagnosis between syphilis and yaws in a country where both affections are to be found. The diagnosis is usually possible in the early stages, but in the later stages it is very difficult. In comparing the structure of a yaws papilloma and a syphilitic condyloma it will be found that the epithelial proliferation of the

former is much less than in the latter. One constant difference is the classical syphilitic change in the vessels shown in the condyloma as in every other manifestation. This change, however, is not found in *Rhinopharyngitis mutilans*, so that the syphilitic origin is excluded.

Studies on Erythrocytes (J. Albert Key, M.D., *Archives of Internal Medicine*, vol. xxviii, No. 5, November, 1921).—Young erythrocytes differ from mature ones in that they have a lower specific gravity and tend to agglutinate or adhere to foreign subjects. The basophilic substance is characteristic of young erythrocytes. In the unaltered erythrocyte it is distributed uniformly through the hæmoglobin containing part of the red blood cell, and when fixed and stained gives pictures of polychromatophilia. The retieulum is formed by the union of this basophilic substance with the supravital stain, and its morphology varies with the stain used. The basophilic substance is not of nuclear origin. It is a protoplasmic constituent, but is not of mitochondrial nature.

Janus green B, used as a supravital stain, stains the basophilie substance of young erythrocytes in the form of an irregular net.

The presence of mitochondria in young erythrocytes has not been satisfactorily demonstrated.

Cytologically, the mature erythrocyte is not a living cell. The hæmoglobin is contained in a hydrophilic gel which is surrounded by a definite membrane.

Abstracts and Reprints.

THE TECHNIQUE OF CHENOPODIUM ADMINISTRATION IN HOOKWORM DISEASE.[1]

By Samuel T. Darling, M.D. and Wilson G. Smillie, M.D.

Chenopodium is now widely accepted as an efficient drug in the treatment of hookworm disease, The maximum dose is 3 c.c. for adults, but the dose most commonly given is 1·5 c.c. with graded dosage for children. Darling, Barber and Hacker found that this dosage should be divided into two parts and given two hours apart in freshly prepared hard gelatin capsules. The last capsule is followed in two hours by a purge. They found that if this treatment was given twice at an interval of ten days, more than 97 per cent. of all hookworms were removed, with slight inconvenience to the patient. There are certain details in this method of treatment of hookworm disease by chenopodium that are not yet definitely worked out. The purpose of the four experiments here described is the study of the technique of chenopodium administration, considering the influence of various factors that affect the efficiency of chenopodium administration in the field. The factors studied are (1) the influence of the preliminary purge, two experiments; (2) the influence of the preliminary starvation period; and (3) the influence of food.

The experiments were all carried out on the same plantation, and on persons living under the same conditions. This coffee plantation was comparable in every way to other large Sao Paulo coffee fazendas: an unprotected water supply, absence of latrines, colonists living in groups of houses, two families to a house, and from twenty to thirty houses in each colony. All persons treated were colonists that were under contract to care for the coffee trees. The method of study was the one used by Darling, Barber and Hacker, in which a trial treatment is given and all stools are kept, and all worms counted and classified. Ten days later a full 3 c.c. test treatment is given to remove all remaining hookworms, and a comparison of the results of the trial and test treatment is made.

Comment.

Preliminary Purge.—It was shown conclusively that a preliminary purge does not add to the efficiency of the divided 1·5 c.c. dose of chenopodium. To the contrary there is a slightly diminished efficiency. The lowering of efficiency in treatment when the preliminary purge is given is still more marked when smaller doses of chenopodium are given in children. We realize that this conclusion is contrary to the generally accepted belief that a preliminary purge should be given in all anthelmintic treatment. Theoretically, also, it would seem that a preliminary clearing of the intestinal tract should prepare the field, so that the chenopodium would be much more effective in removing hookworm. This experiment and many of our previous experiments have invariably shown, however, that the preliminary purge not only is not necessary in the treatment of hookworm disease with chenopodium, but, to the contrary, actually reduces the efficiency of the drug.

Preliminary Starvation Period.—Theoretically, a preliminary period of from fifteen to twenty hours' starvation before chenopodium administration should leave the intestinal tract empty, and enhance the activity of chenopodium treatment. This does not occur. There is rapid absorption of chenopodium, with marked symptoms of intoxication, and the efficiency of the treatment is considerably lowered. This failure is especially marked in the children who are given small doses of the drug. We have no explanation for the findings of this experiment. They agree with the results obtained by Darling, Barber and Hacker.

Food taken during Treatment.—There are various theories concerning the taking of food during chenopodium treatment. In Brazil the belief is almost universal that food eaten during the treatment is sure to result fatally. In the Netherlands Indies, on the other hand, some physicians believe that chenopodium may be administered with food without diminution of its anthelmintic properties.

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxvi, No. 7, 1921.

Neither of these theories is correct; a light breakfast of a cup of milk with coffee and a little bread, taken during chenopodium treatment, reduces the efficiency of the treatment by more than half. In children, especially when small doses of chenopodium are given with food, the drug has very slight action on hookworms. There is also no absorption of the drug, very few symptoms are experienced, and the common toxic manifestations of routine chenopodium treatment are conspicuous by their absence. The food was given only during the treatment in these experiments. If food had been given two or three hours after the administration of the drug and just before the administration of the purge, the results might have been disastrous. Field directors in Brazil believe that eating food during treatment is one of the chief causes of severe chenopodium poisoning; but in their cases food is eaten at the end of treatment and not at the beginning. We can say definitely that food administration with chenopodium does not cause increased absorption of the drug.

The conclusions to be drawn from these experiments are self-evident.

Conclusions.

(1) A preliminary purge does not add to the efficiency of the treatment with chenopodium, when the drug is given in two doses, 1·5 c.c. being considered the adult dose.

(2) A preliminary starvation period is not necessary in the treatment of hookworm disease with chenopodium in divided doses of 1·5 c.c.; on the contrary, the efficiency of the chenopodium is lessened.

(3) A small amount of food given coincidently with the drug, when the chenopodium is given in divided doses, greatly diminishes the efficiency of the drug in the treatment of hookworm disease.

(4) In the smaller doses of chenopodium that are given children the decrease in efficiency caused by the factors of preliminary purge, starvation period, and food is much more striking than in the full adult dosage of 1·5 c.c

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THE PREPARATION OF TIKITIKI EXTRACT FOR THE TREATMENT OF BERIBERI.[1]

By A. H. Wells.
Chemist, Bureau of Science, Manila.

In the preparation of rice for the market the glume or husk is first removed, then the grain is polished and made white by the removal of pericarp layer. This pericarp layer also constitutes the polishings, or tikitiki. In the Philippines tikitiki is sold as a cattle food, the best grades bringing about 4 pesos (2 dollars) per sack of 50 kilograms.

Chamberlain and Vedder obtained cures of infantile beriberi by the use of extract of rice polishings made by extracting the fine powder with 90 to 95 per cent. alcohol, using 3 litres of alcohol to each kilogram of polishings for the first extraction, and 1·5 litres of alcohol for each of the two following extractions. The extracts obtained were combined. Thus they observed a higher concentration of protective and curative substances in the final extract. The same authors later decided to reduce the percentage of alcohol to 90 per cent. strength and to heat the extraction to 60° or 70° C.

In the later part of 1913 the Bureau of Science commenced the manufacture of an extract of tikitiki for the cure of infantile beriberi. The method as outlined by Williams is as follows:—

Take 25 kilos (half a sack) of tikitiki and soak in 75 litres of 20 to 25 per cent. alcohol overnight or longer. Put in a cheese-cloth sack and press slowly until pressure reaches about 80,000 lb. Obtain about 60 litres of extract, allow to stand, and put in still and evaporate under 15 cm. pressure or less. When concentrated to about 3 litres, remove, filter, and mix the clear liquid with an equal quantity of 90 per cent. alcohol, which will cause precipitation. Let stand overnight, decant from the precipitate, and evaporate under vacuum to about 1·7 litres. Filter if not clear and bottle. Sterilize the bottle at about 60° C. for twenty minutes for three consecutive days. One c.c. of this extract equals 15 grm. of tikitiki. The strength of the recovered alcohol will be from 20 to 80 per cent. by volume. This is diluted with water to make 20 to 30 per cent. alcohol, and is used repeatedly.

Dose.

Ordinary dose: Three (3) teaspoonfuls daily.

Serious cases: Double dose or more, according to requirement.

This method was used in the Bureau of Science until January 1, 1916. The results obtained from the use of this product were so favourable that in 1916 it was decided to revise the method and to increase the production. During 1916 there was obtained a maximum possible reduction with the equipment at hand. Prior to this time one small copper still was utilized for concentration. At this time a much larger still, which had been used for essential oil work, was put in operation for the first distillation. By the use of these two stills the production was brought to 6,687 bottles during 1916. During 1917 and 1918 certain revisions in the methods of filtration made it possible to increase the production to 8,188 bottles in 1918. In 1919 one small 3-lyria glass-enamelled still and a Sharples laboratory centrifuge were installed. By the aid of these units larger quantities were worked up with a quicker and more effective separation of the inactive substance and a greater concentration for the final product. Year by year the demand for the product has increased until, at the present time, the Bureau of Science is unable to supply more than a fraction of the actual requirements of the distributors.

The finished product is placed in 50 cm. bottles,

[1] Abstracted from the *Philippine Journal of Science*, vol. 19, No. 1. July, 1921.

which are sealed, pasteurized, and labelled at the Bureau of Science prior to delivery to the various organizations for distribution. Such organizations as the Public Wolfare Board, La Liga Nacional para la Protection de la Primera Infancia, and the Philippine Health Service regulate the distribution, in order to ensure that treatment shall be administered to patients by competent physicians.

Present Method of Manufacture.

Rice polishings for use in this process must be free from insects, clean, and finely ground. The polishings from freshly milled rice of a new crop are preferable. The tikitiki (the rice polishings) is extracted for a period of forty-eight hours in a solution of alcohol of 25 per cent. by weight (determined by use of the Abbe immersion refractometer). The proportion of tikitiki to alcohol is one to two. Agitation is employed to a certain extent. After decantation the residual sludge is passed to the press. The combined extracts are then passed to the distillation plant and evaporated under a pressure of 1 cm. with a maximum temperature of 75° C. The alcohol from this distillation is recovered and passed back to the extraction plant. This first distillation is stopped when the gravity of the extract has reached 1·18 at 70° C. The syrup at this density is allowed to stand overnight, or for a sufficient length of time for it to cool and settle completely. It is then decanted, and the cloudy portion passed through Sharples supercentrifuge.

The resulting clarified syrup is further freed from inactive substances by treating it with slightly over one-third of its volume of 95 per cent. ethyl alcohol. The gummy precipitate, well formed, is separated by means of the supercentrifuge and the alcoholic solution passed to the evaporator or smaller still, where the alcohol is recovered and the syrup concentrated under the same pressure and limit of temperature as before stated. The density of this final syrup is thus brought to 1·32. Upon cooling and standing overnight a flocculent precipitate of inactive substances forms, and this is separated by again passing the syrup through the supercentrifuge. The finished product is then heated to 65° C., bottled, pasteurized for three successive days at 62·5° C., labelled, lacquered, and delivered to distributors.

Throughout the whole process as outlined above the extract comes in contact with metal only while in two of the stills that are tin-lined. One still is glass enamelled, although this is not absolutely essential. The precipitation, cooling, and storage are done in glass- or porcelain-lined vessels.

Due to the tikitiki being somewhat heavy, agitation is advisable in order to gain maximum extraction. Highly efficient recovery of alcohol is not obtained under the present method of coil and water condensation.

By the method outlined a clear thick syrup of good flavour is obtained. One mil of this tikitiki extract represents the active constituents of 20 grm. of tikitiki, or rice polishings.

Tikitiki that has been in storage for a long time or that shows indications of mould growth has a tendency to produce an extract which is high in acidity, and which is not palatable. Also, an old tikitiki is usually highly infested with beetles and other insects. Such a product not only lacks the quality stated above, but gives a much lower percentage yield of finished extract. Also in the evaporation of extracts made from inferior grades of polishings, foaming takes place with consequent loss of time and yield.

There are two grades of tikitiki: that from the light-coloured or white rice, and that from the dark or red rice. Experimentation with the tikitiki from the red rice did not give satisfactory results; the inactive substances were not easily precipitated nor wholly separable by centrifuge, and the extract obtained was of a very dark colour and harsh in flavour. Further experiments will be made with the red polishings, and favourable results are expected.

The process of the manufacture of tikitiki extract at the Bureau of Science has been well established. The extract is demonstrating by its therapeutic action that it possesses a high percentage of neuritis-preventing substances, and that it is a cure for infantile beriberi.

The Public Welfare Board at present (March, 1921) requires 10,000 bottles of this extract monthly. The Philippine Health Service and other organizations are purchasing tikitiki extracts made by local druggists in order to fill their requirements. Such extracts are often made without the use of vacuum, and analysis by the Bureau of Science has shown that they contain glycerine, sugars, inactive substances, and in many cases high percentages of alcohol. Many of them give very little or no precipitate with phosphotungstic acid. The great number of these preparations made and disposed of on the local market may be taken as an indication of the prevalence of the disease.

A plant with a capacity for the production of 15,000 bottles per month would permit the carrying out of a campaign for the treatment of beriberi throughout the Philippine Islands, and within one year from the installation of such a plant statistics on infant mortality would show a decided decrease.

Medical News.

Proposals for Anti-malaria Work in Palestine.—The author is of the opinion that if malaria was under proper control, Palestine would be one of the healthiest places to live in, the climate being mild with no sudden changes of atmosphere. He outlines measures to be taken against malaria, such as drainage, quinine prophylaxis, intensive treatment of reservoirs of the parasite, destruction of anophelines and general hygiene. The beds and banks of the Jordan should be trimmed, and canalization with extensive cultivation of drained territory should be carried out.

Original Communications.

PLAGUE AS A PUBLIC HEALTH PROBLEM IN THE CITY OF BANGKOK.

By RALPH W. MENDELSON, M.D.

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THE study of plague as it exists in Siam, and with special reference to the city of Bangkok, brings to light a variety of facts that are of extreme interest to the public health officer. We have to deal with an endemic disease, the same often becoming epidemic. We have also to deal with an ignorant and superstitious people—medically speaking certainly. Our activities are controlled by an absolute monarchial form of government very susceptible to the public opinion of the masses, and combined with this there is a State religion which in itself is a great impediment when it comes to applying modern methods of disease prevention.

A similar state of affairs exists, to a degree at least, in other Far Eastern countries, and it is sometimes of value to others, who labour under the same difficulties, to picture a problem as described by another, although no method of solving it may be given. It may therefore be of some benefit to other public health officers to read the following short article, and if so the author's motive for writing it will have been justified.

Let us consider then the problem in some detail, and see whether or not it can be solved with some degree of satisfaction under conditions as they actually present themselves.

The official history of plague in the city of Bangkok dates from December 20, 1904. In other words, that is the first time a diagnosis was made. Certainly it must have existed many, many years before this, although there are no records of it having been notified, and, as a matter of fact, the first authentic case in the immediate vicinity dates from 1899, when plague affected the Malay States. But it does not seem probable that the country could have escaped the disease up till this time when neighbouring countries like Burma and China were suffering from it as far back as 1736, as history records the occurrence of a severe epidemic, both fatal to man and rats, in the province of Yunnan.

From an examination of the plague graph it would at first appear as though there was a certain periodicity to the epidemic phase, but as the statistics are hardly reliable for the first few years too much emphasis cannot be attached to that point. But taking it from the year 1910 we do find a three-year high period, then a three-year low period, again followed by a four-year high phase, and this in turn by three years of very few cases. Although 1921 is not shown on the graph, it will be one of our lowest years. Therefore it behoves the authorities to at least be on the alert for the year 1922, for should this periodicity prove to be actual, we may expect its epidemic feature to reappear.

As to the monthly incidence we at once see that March is the plague month, and this is forcibly illustrated in the graph. If we now turn to the chart recording the average monthly incidence, the atmospheric temperature and the mean relative humidity, we find a condition that corresponds in general with the view accepted as to the effect of climate on the propagation of plague. It will at once be seen that in the month of November the temperature just falls below 80° F., and at once we have an increase in the number of cases, the same having gotten a good start continue to increase up until the middle of March, when we have our highest mean atmospheric temperature, and from then on we have a marked decrease in the number of cases until the month of November. September and October are the best months. During that period of the year the mean temperature is between 82° F. and 83° F., and the mean relative humidity is the highest of the season. Thus we see from the graph that when it is hot and wet plague is endemic, and as soon as it gets cool and dry plague becomes epidemic, and continues so until controlled again by a mean atmospheric temperature above 80° F. and a mean relative humidity above 73 per cent.

Under conditions as they actually exist in the city of Bangkok at the present time, the efforts on the part of the office of the medical officer of health to control plague amount to nothing at all. And why is this so? A full appreciation of the following will enlighten the reader.

In the first place we have been unable to have passed a building law that is at all satisfactory. Although there is now, and has been for a few years, such a law under consideration, the vested interests of the country, together with the general opposition of the masses, has made it impossible to get such a law on the books. Taking the city as a whole, we find it to be one immense rat nest, with conditions for breeding and securing food absolutely ideal. There are in the city thousands of rickety buildings, with floors just a few inches above the ground. The habit of the common people to throw refuse under the house or into the compound furnishes the rats with all they require in the way of nourishment. Then, again, there are dozens of wooden rice mills that simply teem with rats and supply the city with a continuous rodent population.

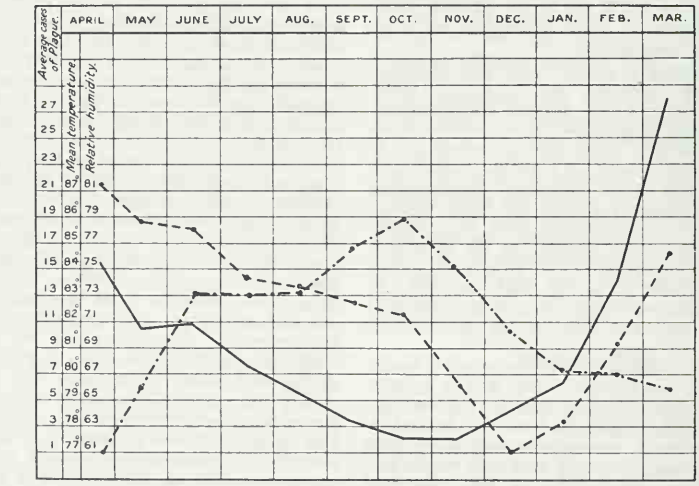
In the last few years there has been a marked change in building construction, not as the result of any law, but as a result of the desire on the part of the people to live in more modern buildings. The medical officer's greatest asset is a real disastrous fire. But such a calamity is only temporary as far as suffering on the part of the people is concerned. In the illustrations will be seen such a fire in progress. This fire took place in a thickly populated and rat-infested area of old wooden buildings. In another illustration will be seen the rat-proof buildings erected in their place, also in still another picture will be seen a permanent plague notification board in front of a new apartment, it hangs on the telegraph pole, and is written in both

Siamese and Chinese. These boards are frequently inspected and kept in repair. They are much more efficient than distributing handbills.

on the other hand, it is of use to keep a small squad trapping rats all the year in order to gradually educate the people up to the idea and have them

PLAGUE IN BANGKOK—NOTIFIED CASES.

	JAN	FEB	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT	OCT	NOV.	DEC.	TOTALS
1904													32
1905		No monthly record – total for year only											24
1906													59
1907													39
1908													51
1909													168
1910													103
1911													106
1912													48
1913	101	210	414	236	157	162	117	86	53	33	34	63	58
1914													43
1915													298
1916													240
1917													147
1918													179
1919													51
1920													28
													1722



Average monthly incidence of plague during fifteen years (————).
Showing mean atmospheric temperature in Fahrenheit degrees (— — — —).
And mean relative humidity in percentages (— · — · — · —).

As to the rat proper, it is of course of no use to even try and run extensive exterminating campaigns until we have our building law in operation. Yet,

in a receptive frame of mind when the time is ripe to actually keep a large campaign going. We are, of course, always finding infected rats in the city,

but are prevented, not only by lack of sufficient authority, in cleaning up an infected area, but also by hostility the result of ignorance, on the part of the people. Yet here we find that in past years, when there were trapped only a very few rats each year, we are now increasing the number gradually and are catching them by the thousands.

Fig. 1.

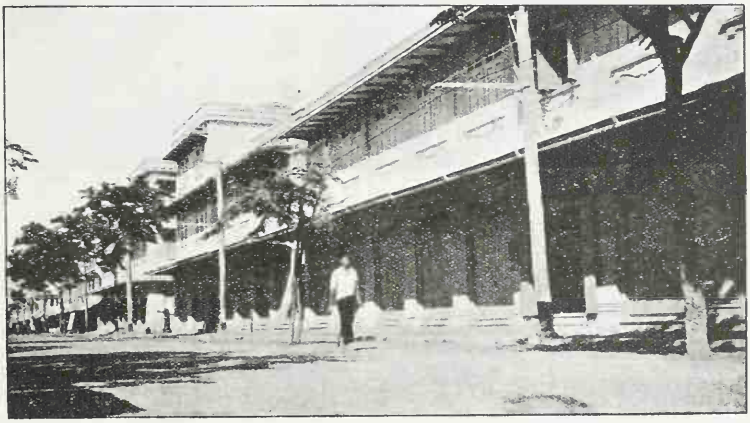


Fig. 2.

In dealing with a human case of plague, we have the authority to clean up the house in which it occurs and to also inoculate the inmates; but, on the other hand, we cannot compel a victim to go to the isolation hospital.

The lack of funds is of course a great handicap, and it remains to be seen how long it will take to educate the proper authorities to a point where they will appreciate the value of money spent on public health.

We are basing all of our hopes and ambitions on one line of effort, and that is *public health education*. The Westerner as public health officer in the Far East must first of all adjust his point of view sufficiently to appreciate to a certain extent the method of cerebration of an oriental brain. If you are working in a country absolutely controlled by the native you must first of all appreciate that fact, and more so if the public opinion of the masses is as powerful as it is in Siam. The people are just in that transition stage between not knowing exactly what they do want, but absolutely convinced as to what they don't want, and unless

properly handled by a wise Government are apt to get out of hand. It is a delicate proposition, and certainly no Government is going to force upon the entire population what appears to them as Western scientific flub-dub.

Realizing these conditions, the author, as stated above, is exerting all his energies, as far as limited finances permit, to educating the public. We have found that even during an epidemic of plague it does not pay to use force in order to control it. Immediately we try and compel the people to submit to inoculations, &c., we have them up in arms. This force does not have to be actual in order to get their ill-will. Just let a medical officer appear in a locality in company with several policemen, and at once the people object to anything and everything. We now work out our own salvation under practically all circumstances without the assistance of the police. We find that our efforts other acute infectious diseases, especially cholera, are of great value, and whenever the financial status of the department permits we increase the number of these boards.

Due to the fact that publicity in regard to health matters is absolutely novel to the country, we cannot expect to cover the entire field at once. We are now planning a public school campaign, and will in due time try and get the assistance of the thousands of priests who are at all times in close touch with the masses. This will meet with marked opposition in most cases, as the priests not only of course control the religion of the country, they to a very great extent are the doctors also, practising the most ancient witchcraft medicine it is possible to imagine, and as this gives them a certain hold on the people, they are not willingly going to lose this bit of control.

The only conclusion the author can come to is

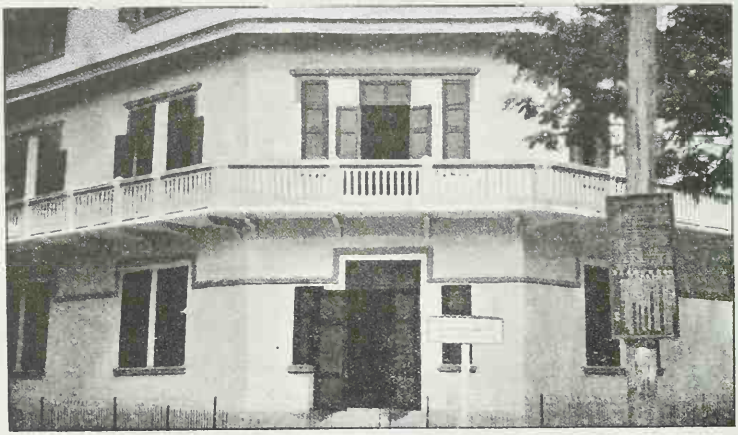


Fig. 3.

are much more appreciated and the results more lasting.

As to public health education the native Press is of great assistance. We issue a weekly health letter to these many newspapers and try to cover every possible subject of importance. In connection with this weekly health letter we also conduct a large clinic. The people are invited to attend the same either for treatment or advice, and in that way we reach thousands every year.

Moving pictures on public health subjects are of great value. We are now having prepared various pictures, the legend to be entirely in the native language. These films are issued to the many local picture houses, and are shown in all parts of the city and its outside districts. The people are all confirmed enthusiasts, and thus thousands who cannot read are reached and impressed with the advantages of applying modern sanitary methods.

Permanent plague boards, as well as boards for that education, though an extremely slow proposition, is, after all is said and done, the only possible way of ever impressing the people and producing permanent results. Practice a wise conservatism, have unlimited patience and persistence, combined with an absolute faith in the righteousness of your cause, and in the distant future there will dawn a ray of sanitary light, that if properly nursed may even develop into a bright star. Who can tell?

BILHARZIA INFECTION IN THE POOL, THE RIVER, AND THE LAGOON.

By F. G. Cawston, M.D.Cantab.
First Streatfeild Research Scholar.

Though most frequently contracted whilst bathing, bilharzia disease is sometimes acquired through drinking water which harbours the free-swimming parasite or through eating the watercress which

grows in the shallow streams. One boy said that he had always avoided bathing in the Mayville pools because so many of his companions had become infected there. He attributed his own condition to drinking water on a hot day from *a pool* at Sydenham. Recently I had under the emetine treatment a poorly developed boy of 12, who states that he has never swum in these pools; but he owns that he has often paddled in them, and sometimes eats watercress direct from the streams. I have obtained numerous fresh-water snails from this watercress, especially *Physopsis africana, Planorbis pfeifferi, Isidora tropica* and *Limnæa natalensis*. All these varieties are sometimes infested with schistosomes and *P. africana* at Sydenham particularly so. A boy of 15 whom I treated successfully with antimony in October, 1920, had contracted the disease on New Year's Day, 1920. During the next few weeks he suffered from urticaria and slight rise in temperature, which was almost certainly due to the penetration of cercariæ through the skin. Skin irritation after leaving the water of infected pools is quite common.

Bilharzia disease is most commonly contracted in semi-stagnant pools, where there are numerous reeds on which the intermediary hosts are found breeding. Domesticated duck have a remarkable power of keeping the pools free from fresh-water snails. The disease is also acquired through swimming in the rivers, and the many *artificial dams* along their course aid in the accumulation of fresh-water snails and other evidences of stream pollution. I have found the species of snails that harbour schistosomes in the Amatikulu, Tongaat, Umhloti, Umhlanga, Umhlangana, Umgeni, Umsindusi, Umbilo, Isipingo, Umlaas, Umbogintwini, Amanzimtoti, Illovo, and in tributaries of the Umhlatazana, in Natal. Stream pollution, which is aggravated by artificial dams and by the erection along the river-banks of factories producing chemical waste has a harmful effect upon fish-life, and many fish feed on cercariæ. Increased pollution destroys the eggs of the fish, and makes their existence precarious by destroying the minute organisms on which fish feed. In these very dams where clean fish find it difficult to thrive because of increased stream pollution, the bilharzia's commoner intermediary host abounds, either attached to the dam-wall or growing on the rushes at the river-bank.

In 1920 I had under treatment a girl of 10 who gave a five years' history of hæmaturia contracted from the Umhlatazana. At her home is an enlarged photograph showing herself, her sister, and her brother wading across the river close to some reeds. Her brother also had suffered from bilharzia disease for some years.

The remedies which are effective in dealing with pools infested with the intermediary hosts are to a certain extent applicable to a river. Rushes should be removed from the bank. People who live near rivers should be encouraged to keep duck. Where necessary, lime or copper sulphate should be added to the water. When approached as to the possibility of bilharzia disease breaking out amongst the D.L.I., which are now encamped at Hill Crest, Natal, I said that a solution of 1 in 500,000 copper sulphate would destroy most snails, and with them the bilharzia parasite. In the *Journal for Agricultural Research* for November 1, 1920, A. C. Chandler describes how this valuable salt may be added to rivers at their source.

The free-swimming cercaria is eminently adapted for penetrating even the thickest of skins, and if contained in wet clothes is very liable to attach itself to the bather. The greater part of its body consists of large cephalic glands where the secretion is formed for dissolving tissue. This secretion is emitted through minute boring processes which are arranged in a circle round the oral sucker, by means of which the cercaria attaches itself to the skin or mucous membrane. However, the short survival time of the cercaria is a very critical one; for there is the danger of its becoming dry, of being eaten by a fish or bird, or of being destroyed by uncongenial surroundings before it effects an entry into its final host. There is no doubt that the waste from sugar mills along the Natal coast is responsible for the comparative absence of the intermediary host from certain localities and for the gradual lessening of bilharzia infection amongst employees on the sugar estates.

A lad of 16 whom I discovered was harbouring the bilharzia assured me that he had never bathed in any pools or rivers, and must have contracted the disease whilst bathing in the Umgeni *lagoon*. The question is often asked whether one is safe from bilharzia infection when bathing in the lagoons along the Natal coast. Naturally a large number of snails must be carried down-stream in the wet season, and, if it were not for the dams, those that are not caught in overflow pools would be carried out to sea by the floods. I have found *L. natalensis* and its eggs on floating vegetation at the very mouth of the Umbogintwini. Some of this species I found crawling about on the sand-bank through which the river breaks on its way into the sea. At another part of the lagoon I found numerous *P. pfeifferi* and *ancyli*, besides some brackish water inhabitants. On this occasion the lagoon water was relatively free from salt, and any cercariæ that might escape from such snails would prove a possible source of danger to swimmers. In the S.A. *Journal of Natural History* for June of this year I have described the effect of various strengths of salt solution on the free-swimming bilharzia parasite. When the sea is coming into the lagoons, many of these snails are killed and the cercariæ are also rapidly destroyed by the sea-water. In the "Voyage on the Beagle, 1832," Charles Darwin recorded (on p. 41) Limnæa in great numbers in lagoons where for part of the year the water was quite salt.

Many of the snails I have collected from the lagoons in Natal are provided with an operculum which enables them to resist sudden changes in environment, and by it they can resist drought for several weeks. Other species, such as those I have mentioned as harbouring the bilharzia parasite in

Natal, die as soon as the river subsides, and they are left on the dry bed of the river. Dr. W. W. Cort has shown that the operculated intermediary host of *Schistosoma japonicum* can resist desiccation for several weeks, and continues to emit cercariæ as soon as it is placed in fresh water again. A similar species, *Tiara tuberculata*, is very abundant in the Umgeni lagoon, and is very heavily infested with cercariæ of various kinds.

Bilharzia infection occurs in all pools, rivers and lagoons which harbour the intermediary hosts and are frequented by persons infested with the bilharzia parasite. As more and more patients undergo the specific treatment for their complaint, there will be less danger of the intermediary hosts harbouring the bilharzia parasite, and as more attention is paid to those localities, such as Mayville, Sydenham and Umgeni, from which Durban derives most of its vegetables, and from which I have obtained the vast majority of infested snails for the complement-fixation test for my bilharzia patients, there will be less likelihood of the disease being so detrimental to the rising generation as it has been for years past.

THE CURE OF MALARIA.

By V. S. Hodson, M.B., B.Ch.Oxon., M.R.C.P.Lond.

Owing to the employment of the very large numbers of troops in malaria-infected countries during the war, great attention has been paid to this, the most prevalent of all tropical diseases. The output of literature is very considerable, and the records of results and theories have been extremely valuable and most helpful.

I have been very much impressed with the almost universal reliance placed on quinine as the one and only means of effectively treating malaria and the almost complete absence of reference to the natural resistance of the human body, and to the fact that no real attempt is made to use this powerful factor. That this factor exists and is of the greatest value is obvious to anyone who has lived in unhealthy areas where natives have no chance of getting quinine and yet enjoy a high degree of health, except perhaps for a short period in years of heavy rainfall. If this factor of normal resistance did not exist it is doubtful if any population could survive, but a healthy population grows in places liable to seasonal malarial infection, but in which no drug treatment is available. This factor is also clearly very variable, and increases and decreases in the same individual according to circumstances. For instance, Sudanese battalions are liable to serve in healthy and unhealthy places. The soldiers are for the most part men born and brought up in malarial districts, and it is observed after two years in Omdurman, which is malaria-free, that a large number of cases of malaria occur on the arrival of the battalion in an unhealthy district, but that, in a short time, these cases cease, and during the remainder of the stay of the battalion in the district the cases of malaria are few in number and mild in degree. What else can this be due to but the reacquirement of intrinsic immunity? I have often met Englishmen serving in unhealthy districts who have assured me that they neither suffer from malaria nor take quinine, but on examination the spleen is found to be enlarged, and it is quite clear that the malaria in their systems is under some controlling influence which is sufficient to prevent the febrile attacks, but insufficient to remove all ill-effects. These cases are interesting, because they are so liable to a sudden and severe attack of acute malaria if they have the balance of malarial infection and intrinsic resistance upset by exposure, excess, or fatigue, &c. A case of my own is typical. There had been no fever for months, and my friend was coming home on leave. He landed at Marseilles in hot summer weather, and in twenty-four hours was suffering the chill welcome of August, 1919. While crossing from France to England, still wearing light clothes, he was bitterly cold, and quite soon after arriving in London he was very ill with malaria. The only explanation appears to be the removal of control when the resistance was lowered by exposure.

A case illustrative of the deleterious effect of fatigue occurred in a man who had had several attacks of malaria, and then after treatment enjoyed good health until he was called upon to put in some extremely heavy work which kept him on duty for nearly thirty-six hours on a stretch. Three or four days later an attack of fever occurred. There was no question of the coincidence of a re-infection, but merely an outbreak of his old disease which had been under control. Last year I met a case which after treatment enjoyed good health, and then came and reported that he was getting slight attacks of fever. I investigated the case to see if I could find any cause for this failure, and finally satisfied myself that the fact that my patient was rigidly keeping the Ramadan Fast, which entails abstinence from food and drink from 4 a.m. to 6.15 p.m. in a temperature rising to 110°-115° F. was ample explanation of his failure to maintain his health. I gave him quite short treatment with quinine on the principle which I will describe later, and he has had no further trouble.

On the other hand, one occasionally sees patients who, at first sight, appear to have no resistance or almost none to malaria, and who get recurrence as soon as quinine is stopped. This absence of normal reaction is more apparent than real, and is usually due to the fact that such cases are suffering from some intercurrent disease or infection which prevents the normal action and reaction taking place.

Having these facts in view I have gradually worked out a system of treatment for malaria which, in my hands, gives excellent results, and which, relying as it does on the combined action of the tendency for toxin to call for the formation of antitoxin plus the help that quinine gives in reducing the poison-forming parasites, is, in my opinion, superior to the line of treatment which is

dependent solely on quinine, and which disregards the very valuable help to hand in what may be called the "Vis medicatrix naturæ" element.

I have no absolute rule for the duration of treatment, because I find that so many factors have to be considered.

For instance, if I am dealing with a man who has had continual attacks since childhood the duration of treatment need not exceed one month, while an Egyptian with his quota of intestinal parasites will require up to three months before he can be considered safe, and even then he is liable to relapse with greater frequency than other persons. In my experience bilharziasis, either rectal or vesical; is particularly liable to cause an apparent extra resistance to quinine treatment for malaria. In fact, I find unless the associated infections, e.g., *Tænia saginata*, ascaris, bilharziasis, ankylostomiasis, &c., are removed that quinine treatment is only partially successful, and that relapses are frequent and recovery slow.

It seems to me that the mental, moral and physical strains arising from war service have much the same effect, and that the unsatisfactory results which have been recorded as occurring, for example, on the Salonika front are easily understandable if these stresses and strains are properly appreciated as lowering resistance to such an extent as to render ordinary quinine treatment more or less ineffectual. On the admission of a case which I consider clinically to be malaria I take the blood, administer an intramuscular injection, 15 gr., and give a purge. The intramuscular injection is repeated on the second and third days, and is then stopped for four days, during which time any intestinal parasites which lend themselves to medical treatment are dealt with, and bilharzia treatment with tartar emetic is begun, but not before the temperature is normal. If no worms are present and the case is otherwise uncomplicated, I discharge the patient on the fifth day to attend as an out-patient or to take quinine according to instructions, one attendance a week for the examination of the spleen and general inspection only being insisted on in the case of the patients one regards as sufficiently reliable to be allowed to take quinine without constant supervision. No attempt is made to "time" the treatment with regard to the cycle of the organism.

There appears to me to be a difference in value between intramuscular injections and oral administration, and for several years now I have worked on the assumption that 45 gr. into the muscles is the equivalent of 80 gr. by the mouth. In an average case of an Englishman or an individual foreign to the Sudan I give injections on three consecutive days, or 20 gr. a day by the mouth in two doses after food on four consecutive days. I continue the full treatment for four weeks, commencing the administration of quinine on the same day of the week as long as treatment lasts. After four weeks' treatment I reduce the dosage to two days for injections and three days by the mouth, and after two weeks of this dosage I again reduce the quinine to one day injection, and two days oral treatment for a further three weeks.

This generally completes the treatment in an average case, but should the spleen persist or should any recurrence of fever occur, the course is modified to suit the circumstances of the case. If a relapse occurs I do not consider it necessary to recommence treatment *ab initio*. I pay particular attention to the exciting cause of the relapse, e.g., fatigue, excess, exposure, or concomitant infection by intestinal or other parasite. My treatment for relapses occurring during treatment varies, but, speaking generally, it is to put the patient on extra quinine for the week of the relapse and resume the ordinary treatment the next week. When the relapse occurs after treatment has ceased I give a modified course, which is considerably shorter than the original period of treatment.

Since I have paid regular and close attention to the fauna of the intestinal tract, the cases of relapse which I know of are fewer than when I was unaware of the extent to which intestinal parasites flourish in this country. I base my treatment on the idea that by giving quinine as indicated I remove the major portion of the malarial parasites, but that a few remain which start again to grow actively as the quinine dies out of the system. As the parasite develops so immune bodies are formed, but not, as a rule, quickly enough to prevent a recurrence of fever if treatment is stopped too soon. Just as the organisms are beginning to go ahead in what is, in seventy-two hours, probably a quinine-free medium, I start quinine again and continue the process for a longer or shorter time, according as I judge it necessary in each individual case. It is this personal equation which make malaria of great interest in whomsoever it occurs. Under this system there can be no risk of the malarial organisms becoming quinine resistant, as in the period in which quinine is not administered all the quinine taken must be got rid of. The basis of success in all methods of quinine treatment is to ensure the absorption of a sufficiency of the drug, and to ensure this in my cases I give injections whenever I think the quinine will either not be taken, or if taken, will be taken irregularly. With regard to dosage I have come to 20 gr. a day for four days by a gradual process, but there are cases which show signs of quininism before the full dose has been taken.

As has been recorded by Nieronstein in observations on malaria, edited on behalf of the War Office by Sir R. Ross, the rapidity of the excretion of quinine varies greatly, and I regard the early occurrence of signs of quininism as an indication that I am dealing with a patient whose co-efficient of excretion for quinine is low.

A case occurred in my practice about two years ago in which the patient stated and truly that 10 gr. of quinine made him stone deaf. I therefore gave him 2 gr. without ill-effect as regards his hearing, but with normal success as regards his malaria. The explanation appears to be that 2 gr. of quinine, which requires five times the usual time

to be excreted, are five times as effectual because, according to Nieronstein (*loc. cit.*), the quinine is excreted as quinine, and therefore must have come to the nephritic sieve as quinine.

In advocating this method of treatment, I am well aware that many others claim completely successful results by other methods, but by this system there is no risk either of the parasites becoming accustomed to quinine or of quininism, and at the same time the system is gradually trained to deal with an unwelcome invader in a way which can hardly occur when quinine in large and continued dosing is the method of treatment, and when no opportunity is given for the natural forces, which are the curing forces, to come into action.

The fact, as Nieronstein (*loc. cit.*) points out, that quinine is excreted at about the rate of 8 gr. to the litre seems, too, to point to the advisability of small or moderate doses of quinine, particularly in climates like that of the Northern Sudan, in which in the hot weather a paltry pint of urine is by no means an unusually small quantity of urine in twenty-four hours.

I have made no special mention of difference of treatment of benign and malignant tertian fever, but in common with most observers I got more satisfactory results from the treatment of the latter than of the former, and relapses appear more frequent and ultimate cure more difficult to secure in the benign form.

The following are actual cases treated:—

(1) J. E. H., British.

Date 1920	Spleen	20 gr. quinine by mouth
February 9 ...	½ inch ...	February 9, 10, 11, 12.
,, 17 ...	Just felt ...	,, 16, 17, 18, 19.
		,, 23, 24, 25, 26.
		March 1, 2, 3, 4.
		,, 8, 9, 10, 11.
		,, 15, 16, 17.
		,, 22, 23, 24.
March 30 ...	Nil	,, 29, 30.
		April 5, 6.
		,, 12.
		,, 19.
May 1	Nil	In good health and has remained so since.

(2) Abdalla M. M., a native of the Sudan.

Date 1920	Spleen	20 gr. quinine by mouth
March 2 ...	½ inch ...	March 2, 3, 4, 5.
,, 9 ...	Nil	,, 9, 10, 11, 12.
,, 16 ...	Just felt ...	,, 16, 17, 18.
,, 23 ...	Nil	,, 23, 24, 25.
,, 30 ..	,, ...	,, 30, 31, April 1
April 6 ...	,, ...	April 6, 7, 8.
,, 13 ...	,, ...	,, 13, 14, 15.
,, 20 ...	,, ...	,, 20, 21.
,, 27 ...	,, ...	,, 27, 28.
May 4 ...	Nil	May 4, 5.
,, 11 ...	,, ...	,, 11.
Seen June 2nd "Fasting"	Just felt ...	June 2, quinine.
June 9	Nil	,, 9, 10.
,, 16	,, ...	,, 16, 17.
,, 30	,, ...	
July 8	,, ...	
,, 22	,, ...	In good health.

(3) Ali Ibrahim.

Date 1920	Spleen	Injections, 15 gr.
January 2 ...	3 inches ...	January 2, 3, 4, 9.
,, 9 ...	1 inch ...	
,, 15 ...	Just felt ...	,, 15, 16, 17.
,, 22 ...	Nil	,, 22, 23, 24.
,, 29 ...	,, ...	,, 29, 30.
February 5 ...	,, ...	February 5, 6.
,, 12 ...	,, ...	,, 12, 13.
,, 19 ...	,, ...	,, 19.

This case had *Tænia saginata* and ankylostomiasis, which were removed on January 6 and 7.

He has not been seen since the conclusion of his treatment.

Observations on the Nature of Pigment found in the Liver of Kala-azar Cases (C. C. Basu, *Indian Journal of Medicine*, vol. ii, No. 1, March, 1921).—The pigments of kala-azar livers are very similar to those in malaria as far as chemical results are concerned but the distribution is different. In malaria the pigments are confined to the periportal tissue and the endothelial cells lining capillaries, whereas in kala-azar the pigments are in the intercellular connective tissue and the liver cells. Formalin fixed livers often show pigment free in the liver capillaries. These are hæmatin granules formed by the action of formaldehyde on hæmoglobin, and they respond to tests for malarial pigment, differentiation being possible only by their distribution.

Cases of Leprosy Cured by Anthrax Vaccine (J. N. Roussel, *New Orleans Medical and Surgical Journal*, October, 1921).—The author describes two cases of leprosy which he treated with anthrax vaccine. The first case was a tubercular leprosy with lesions on the face, arms, legs and body, only few of which were anæsthetic. There was pronounced leonine expression and huskiness of the voice. Liquid anthrax vaccine was given twice a week, starting with 0·25 c.c., and increasing to 1·05 c.c., with no apparent relief except a slight chilliness occurring five or six hours after injection. After two years the patient had fully recovered. The other case was one of macular-anæsthetic leprosy. Injections of anthrax vaccine were given every four days with successful results.

Uncinarial Nephritis (F. Rojas, M.D., and J. T. Morengo, M.D., *Achives of Internal Medicine*, vol. xxviii, No. 5, November, 1921).—In the nine subjects studied, hookworm infection caused nephritis with chloride retention. The index of urea excretion was low in three cases. The return to normal took place as soon as anthelmintic therapy expelled the hookworms, although the red cell count was still low. The ætiology of this nephritis is, according to the author, the infection by hookworms; its pathogenesis remains unknown.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 16, 1922.

NOMENCLATURE.

FOR want of a more appropriate term, a word upon the "nomenclature" in use in medical literature is of such a nature nowadays that medical practitioners can be excused if in their busy lives they fall behind in keeping up with it. Every branch of science has its own technical language, and so many branches of science have been admitted into and incorporated with medicine in the past decade that a fresh volume to cover even the new words, not to speak of the recent phraseology added to our literature and the compound words coined to comprehend the new families of thought and literature embraced in the nomenclature of medicine to-day, is required if we are to understand aright.

As with appliances and branches of study and treatment, so with clinical reports do we find their language so profound in their mysteries that such a report as is here appended is not a rarity. It is not a European piece of literature, but the patient was handed a diagnosis of her ailments and condition to be shown to her European doctor. This happened to be none other than the writer, who, mystified and astonished at the wealth and depth of the non-European doctor's learning and literature, had to consult a medical dictionary to get the full meaning of the diagnosis. It is headed "Diagnosis," and reads as follows: "Pluro (*sic*) glandular dystrophy—hyperthyroidism predominating—vagotonia. Infected tonsils, slight, moderate gastro-enteroptosis—mucous colotis (*sic*). Tricocephalus dispar."

The name and the address of this paragon of medical legendary literature were added, and the patient was impressed beyond description with the man and his gifts. To such an extent did this worship hold that, although she had come to settle at home with her husband, as she was no better, she insisted on going back some 5,000 miles to see him again. She said English doctors were no good, and her husband, whom I knew since his childhood, did everything to try to prevent her going. The sequel to this is that six 3-gr. doses of santonin cured her by bringing away many round worms; she had come from a district in China where round worms throve, and where every spring and autumn every British man, woman, and child took santonin as a matter of course. This lady had omitted so to do, hence the wonderful ailments from which she suffered, and which allowed of my getting possession of a copy of the diagnosis of this Æsculapius.

On the same day I read this I came across the description of the ailments that distressed the poor woman in the "Backache pills" picture, "where every pictures tells a tale," and wondered which was the more wonderful. Perhaps the symptoms of the woman who is cured by "Pink pills" have to be studied to find a parallel. Here is the description of a woman suffering from an ailment which the doctors failed to diagnose completely cured by "Pink pills." No such group of symptoms as is here described corresponds to any disease in the College of Physicians catalogue, yet here it is, and the means of cure appended. I failed to decipher the ingredients contained in my patient's doctor's prescription; it was as much a hidden mystery to me as the composition of the "Back pills" and the "Pink pills." So there let the matter rest.

Speaking of nomenclature and China, in 1889 influenza was pronounced to be present in Hong-Kong. The writer named the epidemic influenza,

but except for the support of my friend the German doctor, Dr. Gerlach, in the Colony, no other supporters were to be found among the medical profession. Hong-Kong was and still is regarded as the first focus of influenza in the epidemic which then began to affect the world, and has continued to do so up to the present day. It was officially denied by the naval, military and colonial authorities to be prosent in Hong-Kong long after all the rest of the world was attacked. Yet so well founded was the diagnosis and report that the epidemiology of influenza written in Australia and set forth by the well-known authority on the course of the disease, has stamped it for all time as authoritative. The military recognized it as Epidemic Catarrh, and the soldiers suffering from the influenza were officially set down in the returns as afflicted with epidemic catarrh, but it was denied that there was any influenza amongst the troops in the garrison.

The writer found a very ancient copy of the Royal College of Physicians of London's nomenclature of disease. And there, sure enough, this legend appeared, "Influenza *or* Epidemic Catarrh." Comment is useless. Much could be said, but it is better unsaid.

Turning once again to the diagnosis legend given above, perhaps it was given to the patient to obscure matters and hide from her the nature of her ailment. She perhaps had been importunate in her demands for a report, and the document had been set out with the intention of camouflaging the nature of the ailment in the patient's eyes. Whatever was intended, it was a "brainy" procedure.

It is difficult to avoid passing on to the region of the physiology and pathology of the nervous system and the nomenclature attaching thereto, but it is here avoided, because the writer is incapable of even off-hand stating the names of the sections of this branch of medicine, for which there are specialists many. It is well, no doubt, that each department of nervous diseases as well as other ailments should have special investigators to study them, and that physicians should be found to take up the treatment of each, but their number and intricacies are beyond most of the labourers outside their own specialty. The knowledge they gain will by-and-by be capable of being set forth to a wider section of the medical public who can understand them. It is many a day since it was said that "the only part of the human body which was not as yet appropriated by a specialist was the umbilicus and two inches around." Perhaps even the two inches will be lopped off by-and-by.

The nomenclature of fresh preparations being poured on the market on every hand is confusing and appalling. Every firm must have its own preparation with its own name to compounds which have similar or identical bases. The doctor seeks explanation of the components from the term under which the preparation appears, he draws upon his stock of Latin and Greek in his attempt to get a hint of the drugs contained within, but in vain. He hears from the very lips of the traveller who calls from this or that firm the marvels the drug is capable of accomplishing, and is requested to give the drug a trial. This he resolves to do, but as often as not the specimen pills, powders, capsules, and so forth are put in a drawer or cupboard, and that is the end of the business. When "clearing up" he comes across these preparations, and he re-reads the label on the bottle, but cannot remember what the medicine was for and how it was recommended to be given or what for. No technical composition of the specimen is indicated by the organic chemistry names given on the box. To the doctor organic chemistry as taught at his medical school is but a hazy memory. The short time given to chemistry was devoted to a very elementary acquisition of inorganic chemistry, and beyond an elementary knowledge of that little else is remembered. What is the cure for this ignorance? It is very simple, a longer course of chemistry at college, perhaps another session, or even a third session, and even then an evanescent acquaintance with *materia medica*, which, when practice has to be faced, will be found to be unrecognizable in his prescriptions, nor given a place in his daily task.

What teacher of *materia medica* in his lectures to students shows and explains the preparations of the day. The drugs he dwells upon are of ancient date, in use in the world for thousands of years; opium occupies more space than any other drug; he seems to devote about one quarter of the short summer session of some twelve weeks to its marvels. Arsenic, digitalis, and a number of standard drugs are dwelt upon at length, and session after session their properties and preparations are repeated, yet the compounds of recent introductions are unmentioned; there is no time. What is the cure for this? More time devoted to the subject—two or three courses of *materia medica* and therapeutics. Without this the young practitioner is not equipped to meet his work. From the prescribing at the hospital, the out-patient department especially, nothing is learnt really. Each hospital has its own pharmacopœia, and its mixtures kept in stock and put up in bulk. The "House mixture," the "mistura alba," the M.R.C.P., the M.F.A.C. are prescribed daily many times, yet when the student is qualified and goes into practice he has to have the pharmacopœia of his hospital in his pocket or on his consulting-room table to enable him to write out a prescription for the chemist to make up "M.R.C.P. and M.F.A.C." or some such hospital formula are frequently given together. In the combination twenty-three separate ingredients are present, and to write out these in full text is a tax on memory which amounts to a super-tax and practically an impossibility, even if he had devoted half a dozen sessions to the study of *materia medica* and therapeutics. In consequence he welcomes the theory of "one drug, one disease," one tablet or tabloid, one disease—a "dock and nettle" system of medicine which, let it be what it may as regards scientific treatment, is handy, speedy in its ordering, and capable of being remembered. A plethora of drugs in various

forms of administration, containing drugs with or without any long and complicated names, baptized with a specific name which gives no hint of the ingredients of which they are composed or the nature of their activities, is a feature of to-day's medicine giving and taking. Its usefulness has to be taken for granted. To what lengths may not this system develop in another twenty years cannot even be imagined.

J. C.

Annotations.

Cases of Infantile Beriberi (A. V. Tupas, *Philippine Islands Medical Association Journal*, June, 1921).—Of the thirty-six cases of infantile beriberi admitted to hospital, thirty were under 3 months of age. Eleven deaths occurred, and Röntgen rays were used in sixteen cases, fourteen of which showed enlargement of the heart to the right and two to the left. A necropsy was made in five of the fatal cases, and the constant lesions found were hydropericardium; punctate hæmorrhages of the lungs; passive congestion of the liver, kidney and spleen; degenerative neuritis of the vagus nerve and dilation of the heart, the right ventricle being three times the size of the left.

Pathogenicity of the Demodex in the Human Being (H. Lawrence, *Medical Journal of Australia*, July, 1921).—The author describes cases of skin eruptions due to *Demodex* which are considered to support the idea that the presence of this parasite in man may have a definite pathological significance. Further microscopical studies are necessary before it can be decided whether the parasites are all varieties of *D. folliculorum* or some acquired *Demodex* such as is found in the skin of dogs.

Studies on the Treatment of Human Trypanosomiasis with Tryparsamide (Louise Pearce, M.D., *Journal of Experimental Medicine*, Supplement No. 1, December, 1921).—The present study of the action of tryparsamide in human trypanosomiasis concludes a series of chemical and biological investigations in a particular problem of chemotherapy, and thus represents the final step in a logical method of approach to such a problem. It has been shown that tryparsamide, the sodium salt of *N*-phenylglycineamide-*p*-arsonic acid, possesses a marked trypanocidal activity in human trypanosomiasis caused by *Trypanosome gambiense*. Single doses of from 0·5 to 5·0 grm. produced a peripheral sterilization of lymph glands and blood in an average of six to twelve hours. The duration of the peripheral sterilization following single doses of 17 to 83 mg. per kilo ranged from seventeen to fifty-eight days in patients, who ultimately showed a return of trypanosomes to the peripheral blood. In a number of patients, however, treated with single doses of 9 to 68 mg. per kilo, no such relapse was detected during an observation period of from forty-nine to one hundred and eleven days. The drug is extremely soluble in water, and may be administered intramuscularly as well as intravenously. The immediate trypanocidal action after intramuscular administration was as rapid as that following the intravenous route, while the duration of peripheral sterilization was appreciably longer.

Relatively few repeated doses produced in advanced cases a marked and rapid diminution of the cells of the spinal fluid, and were associated with definite improvement of mental and nervous symptoms. The occurrence of visual disturbance in certain advanced cases was the only untoward effect detected during the course of the work, and was apparently related to a too frequent administration of the drug. The condition was transitory in the majority of instances, and resumption of treatment was not followed by a recurrence of this symptom.

The general beneficial effect of the drug was a noticeable feature of its action in both early and advanced cases as shown by the disappearance of subjective symptoms, by the return of the pulse and temperature to normal limits, by the pronounced improvement of the blood picture, and by well-marked gains in weight.

Current Literature.

THE AMERICAN JOURNAL OF TROPICAL MEDICINE. Vol. I, No. 1, January, 1921.

An Attempt to explain the Greater Pathogenicity of Plasmodium falciparum as compared with other Species (C. C. Bass).—The theoretical explanation offered for the greater pathogenicity of *Plasmodium falciparum* is that the shape of the parasite and unyielding consistency of the substance of which it is composed results in parasites lodging in capillaries to greater extent and there multiplying in larger numbers, more of which survive than occurs in the other species. The amœboid activity is greater, and the cytoplasm is less resistant to pressure in the other species which is unfavourable to their lodging in the capillaries, causing more of the segmentation to take place in the circulation where the merozoites produced are promptly destroyed. This theoretical explanation is based largely upon the observation that artificially cultivated falciparum parasites are more resistant to pressure, that they have little or no amœboid motion in contrast with the other species, and upon the finding at autopsy of much larger numbers of capillaries obstructed by falciparum parasites.

Natural Malaria Infection in Anopheles Mosquitoes (W. V. King).—Collections were made during the months of May to November by negro convicts on a State penitentiary farm of mosquitoes, which were examined to determine the rate of

infection in malarial regions. The proportion of mosquitoes infected in different localities is of course subject to a great deal of variation, and depends upon the susceptibility of the species of Anopheles present, the number of human gamete carriers on which to feed and many other factors. As examples of rather extreme conditions of natural infection, some of the studies reported from India and Africa are of interest.

On the Prevalence of Carriers of Endamœba dysenteriæ among Soldiers returned from Overseas Service (Charles A. Kofoid and Olive Swezy).—The number of carriers of amœbiasis in the United States has been greatly increased by the infections in soldiers returning from overseas. A larger number of carriers than has hitherto been suspected exists in the normal population in this country. The dysenteric syndrome is not an essential feature of the disease, and the infection is by no means limited to the tropics. The carrier phases are persistent and afford possible foci of contagion. The percentage of carriers relapsing or developing serious sequelæ is as yet unknown.

Study of a Case of Yaws contracted by an American Soldier in France (J. F. Schamberg and J. V. Klauder).—A case of yaws is described in a young American soldier who served in France from 1917 to 1919. In May, 1919, he was sent to a hospital in England suffering from rheumatic-like pains in the knees and shoulders which were at times severe enough to incapacitate him. Later, after a short bout of fever, the pains gradually disappeared. In October lesions appeared on the palms, scalp and soles of the feet. Syphilis was denied. In December, 1919, he was admitted to hospital with lesions on the palms, soles, scalp, nose, forearm and penis. The lesions in general were distinctly fungated and granulomatous, and a diagnosis of yaws was made. Neoarsphenamine, 0·9 grm., was administered, which caused the disappearance of many of the lesions and a marked improvement in others. Sixteen days later a second dose was given which caused complete disappearance of the remaining lesions, and the patient up to the present time has remained well.

Report of a Case of Bacillary Dysentery with Diphtheritic Membrane in the Vagina and Œdema of the Abdominal Wall (I. I. Lemann).—A case is described of a bacillary dysentery in a white woman, aged 48. On November 5 she had eaten a cream puff which did not seem very fresh; the next day she had severe pains in the epigastrium and loose bowels with straining. The symptoms increased until November 15, when she was seen by the author. The face was pinched, the temporal fossæ were sunken, and the general appearance was that of great prostration. The bowel movements had continued to be numerous, bloody and mucous, and extremely offensive. The patient had vomited once, though she suffered from nausea. There was marked œdema of the abdominal wall, slightly greater in the upper right quadrant. Treatment consisted of liquid diet without milk; sodium sulphate solution daily into the duodenum by means of the Jutte tube; irrigations of the vagina three times a day with 1:1,000 permanganate solution. Improvement began immediately.

Medical News.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT. 67TH SESSION. SEPTEMBER-DECEMBER, 1921.

With Distinction.—E. P. Hicks, M.R.C.S., L.R.C.P., M.B. (Winner of "Duncan" Medal); E. S. Godlieb, L.R.C.P. and S., L.R.F.P. and S., Ceylon Med. Ser.; G. D. English, M.B., Ch.B.; E. A. C. Langton, M.R.C.S., L.R.C.P., Uganda Med. Ser.

Miss A. Reubens, M.B., B.S.(Bombay); C. F. Chenoy, M.B., B.S.(Bombay); A. G. Boggs, M.D. (Harvard), American Baptist Missionary Society; C. U. Lee, M.B., Ch.B.(Glas.); J. R. McVail, M.B., Ch.B.(Glas.), Straits Settlements Med Ser.; B. Shaha, M.B.(Calcutta); F. G. Spear, M.B. (Camb.), D.P.H., M.R.C.S., L.R.C.P.; J. A. Young, M.B., Ch.(Edin.), Somaliland Med. Ser.; H. C. Wilkinson, M.D.(Columbia); H. C. Hofmeyr, M.B., Ch.B., B.A.O.; G. N. Cossery, Diploma M. and S.(Cairo), Public Health Dept., Cairo; J. Dimock, M.R.C.S., L.R.C.P., L.D.S., West African Med. Ser.; J. Pedris, L.R.C.P. and S.(Edin.), L.M.S.(Ceylon), Ceylon Med. Ser.; J. D. Gazder, M.B.(Calcutta); H. S. Hutchison, M.D.(Cleveland); A. H. Mitchell, M.B., Ch.B. (Aber.), Kenya Med. Ser.; G. D. K. Waldron, M.B., Ch.M.(Sydney), West African Med. Ser.; Miss Reba Hunsberger, M.D.(Phila.), American Board of For. Miss.; J. A. A. Kernaham (Major, I.M.S.), M.R.C.S., L.R.C.P.; P. M. Nanavati, L.M.S.(Bombay); M. Ramy; A. Bindari, M.D. (Beyrout); M. H. Eid, L.S.A.; J. F. Misquitta, M.B., B.S.(Bombay); D. M. Taylor, M.B.(Glas.), Capt., I.M.S.; W. Spiteri, W., M.D.(Malta), West African Med. Ser.; M. Shalaby, Med. Dip.(Cairo); H. Buchanan, M.D.(Chicago); K. C. Kirti, L.M.S. (Calcutta).

December 14, 1921.

THE UNIVERSITY OF LIVERPOOL.

EXAMINATION LIST. DECEMBER, 1921.

Faculty of Medicine.

Diploma in Tropical Medicine.—G. P. F. Allen, M.B., Ch.B.; C. R. Corfield, M.D.; A. Hamid, M.B., B.S; B. W. Longhurst, M.R.C.S., L.R.C.P.; G. A. Macvea, L.R.C.P. and S., L.R.F.P. and S.; H. R. Madan, M.B., Ch.B.; W. P. Mulligan, M.B., Ch.B.; S. S. Shri Kent, M.B., Ch.B.

Recommended for the Alan H. Milne Memorial Medal.—Dr. G. P. F. Allen.

EDWARD CAREY,
December 15, 1921. *Registrar.*

Original Communications.

SOME NOTES ON INTESTINAL BILHARZIASIS IN THE WEST INDIES.

By S. B. Jones, M.A.Durham, B.A.Lond., M.D.Ill. Med. Coll.
Temporary Medical Officer, Anguilla, B.W.I.

In consequence of a shortage of medical men with British qualifications on account of the Great War, I offered my services in 1918 to the Government of the Leeward Islands Colony, and was appointed a supernumerary medical officer, stationed at first in District No. 2, St. Kitts, from April 25 to August 8, 1918, and in District No. 5, Anguilla, from that date to the present time.

It was while serving in the former capacity that I first saw a case of intestinal bilharziasis in a little boy who lived at Boyd's Village, not far from Basseterre, the capital of St. Kitts. The children of the village were heavily infested with ascarides and received appropriate treatment, this child along with others. Most of them showed signs of improvement save this little fellow, whose emaciated body and enlarged abdomen with presence of ascites misled me for a time in thinking I was dealing with a case of tuberculous peritonitis. The passage of bloody mucus in the stools, however, induced me to make a microscopical examination of a specimen of fæces, with the result that I was able to make a final and positive diagnosis of intestinal bilharziasis by finding the characteristic later-spined ova of the *Schistosomum mansoni*. Ova of other parasites were also present, chiefly *Ascaris* and *Trichiuris trichiura*.

Upon my transference to Anguilla I examined numerous specimens of fæces, but up to the present time I have not been able to find the disease occurring in a native of this island. But early in February, 1920, I saw an imported case in a young girl, R. B. (fig. 1), 13 years old, who came from the village of Colombier, French St. Martin, for medical advice. She complained of "bad belly," cramps around the navel, palpitation of the heart, passage of blood in the stools. Her mother stated that she had been ill for five months, and that an older sister had died of a similar trouble. The prominent abdomen of the patient led me to suspect bilharziasis of the intestinal variety, a suspicion absolutely confirmed by microscopic examination of the fæces. Polyparasitism existed in this case also, ova of *Ascarides*, *T. trichiura* and *S. mansoni* being extremely numerous. The child was rather emaciated, and a systolic cardiac murmur was present, which might account for the palpitation of the heart of which she complained.

From that date up to the present time about twenty-four cases have been seen, in each of which the diagnosis was arrived at after microscopic examination. With few exceptions they were inhabitants of the village of Colombier, French St. Martin. Some of these complained of dysenteric symptoms, but they were not many. Most sought medical advice because of pain in the splenic and hepatic areas. These were the cases sometimes confused with chronic malarial cachexia with "ague-cake" spleen. Swelling and tenderness in the epigastric region were often noticed, accompanied at times by lumbar and abdominal pains. Fluid in the peritoneum could be detected on percussion in some of these. Two or three had fever in the afternoon with an urticarial eruption, "the mad blood" of West Indian parlance. A few young women stated that their symptoms began at a time when they got a slip or a fall which made them think that there had been displacement of the pelvic organs. The gradual enlargement of the abdomen in one case led to untruthful rumours of pregnancy. Three of the young women complained of amenorrhœa, due, since other causes could be safely excluded, to bilharzial infection.

One of the most interesting cases was the following:—

B. M., 22 years, French St. Martin, complained of amenorrhœa lasting over nine months. Malarial infection was suspected. The spleen was enlarged, the heart muscle was feeble, and a condition of profound anæmia undoubtedly existed The patient could scarcely walk five or six steps without danger of falling. There was abdominal enlargement. Percussion revealed fluid in the peritoneum. Patient had a temperature of 101° F., and she stated that the fever came on daily in the forenoon. Urgent insistence caused her to leave a sample of fæces, which on being examined later showed numerous ova of the *S. mansoni*. A portion of this was sent to the Chief Medical Officer, St. Kitts, for verification of the finding. This patient is reported to have improved considerably under treatment with emetine hydrochloride, the amenorrhœa even disappearing, but she died later, it is said, from a severe hæmorrhage by way of the mouth, which occurred after undue mental excitement.

Certain symptoms of the disease are not unlike those of hookworm infection as seen in the Southern United States. C. H., a lad of 20 years (fig. 2), seemed to be only 12 years old, so stunted was his growth. His spleen was enormously enlarged, reaching almost to the pubis. P. J. B. (fig. 3) reluctantly confessed to dirt eating. Four or five mentioned ground itch as affecting them a short time after wading in the water of the stream that ran through their native village.

The brunt of the attack was borne by children and young adults between the ages of 12 to 25 years. Middle-aged persons from the same district had developed immunity to such a degree that, though living under identical conditions, repeated examinations showed no ova of the *S. mansoni*.

As noted above, this disease occurs in some parts of the island of St. Kitts. While making a short visit there in May, 1921, I again visited Boyd's Village, and saw a brother and sister of the patient first mentioned. One was constantly troubled with the passage of mucoid stools streaked with blood, I learned; the other was not, but both had the ova of the *S. mansoni* in their stools.

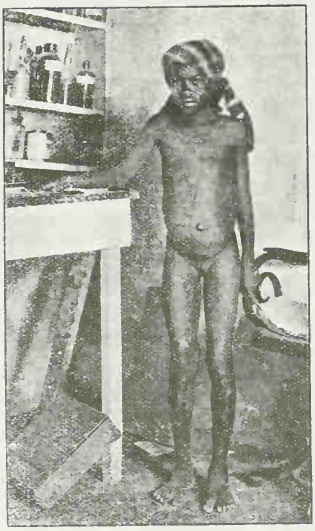

FIG. 1.—Bilharziasis.

FIG. 3.—Bilharziasis—"Dirt eater."

FIG. 2.—Bilharziasis characterized by splenomegaly.

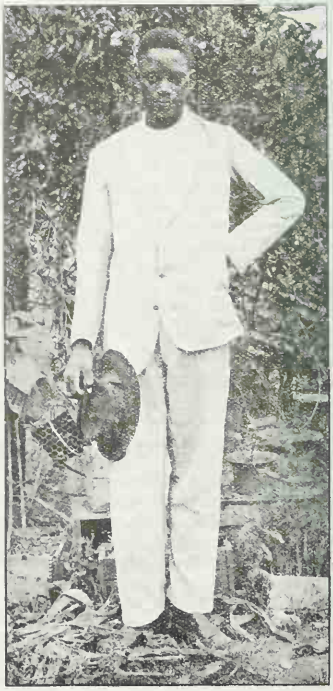

FIG. 4.—Bilharziasis (symptoms very slight—occasional tenderness in splenic area).

In none of the cases observed was hæmaturia present; in none were found ova of the *S. hæmatobium* with terminal spine. It seems safe to conclude that the syndrome was due solely to the *S. mansoni*. The number of patients complaining of the various symptoms is as follows:—

Epigastric fulness	5
Splenic enlargement	3
Hepatic enlargement	3
Dysentery	3
Cardiac arrhythmia	3
Anæmia	1
Lumbar pains	3
Amenorrhœa	3
Polyparasitism	3
Geophagy	1
Ground itch	1
Ascites	3
Urticarial eruption	2
Fever	2

Beyond directions as to prophylaxis of the water supply—boiling drinking water and exposing that used for bathing to the sunlight for a day—and treatment with emetine hydrochloride in a few instances, no active curative measures were undertaken. Where *Ascarides* were present, oil of chenopodium was, as usual, most effective in ridding the host of these and at the same time ameliorating the symptoms of gastric distress caused by the bilharzial parasites. Intravenous injections of tartar emetic, now regarded as the treatment, *par excellence*, advised by Drs. Christopherson, Low, Cawston and others, were not attempted as the patients were not sufficiently under control.

In the study of this disease there are several practical health problems involved. The disease being present in St. Martin and St. Kitts, the natives of Anguilla who travel freely to both islands on business and on pleasure are likely to become infected. For example, two of the young men examined had gone to Santo Domingo with the disease and were returning to their home in St. Martin by way of Anguilla, many ova still being present in their stools. Hence it is not impossible for a serious infestation to spread to Anguilla. But in this connection other factors must be considered. (*a*)What is the source of the infection at Boyd's Village, St. Kitts, with an excellent supply of pure drinking water, pipe-borne from a reservoir which is beyond the reach of contamination? (*b*) What snails there constitute the intermediate hosts? (*c*) Should the infection be attributed to the supply of drinking water ingested by mouth, or to the larval forms of the parasite burrowing beneath the skin of the children as they wade in the numerous streams in which that island abounds? Intestinal bilharziasis being a water-borne disease it does not seem likely that the disease will become a peril to Anguilla, as there are no streams, and the climate being extremely dry, the cercariæ hatched out from the ova of the worms are not likely to survive for any length of time. The situation would be far different in the rainy season, when the rock holes, liable to fæcal contamination, afford the main water supply for weeks at a time. If the snails which are the intermediate hosts are to be found in Anguilla, then a more serious plague than the pink boll-worm or small-pox and not admitting of the same degree of control.

SUMMARY.

Intestinal schistosomiasis exists in French St. Martin and St. Kitts. It may possibly be found in other islands of the West Indies, for Manson's classic case was in a gentleman from Antigua.

The snail which is the intermediate host should be investigated and the source of infection determined.

The disease is a menace to the health of the whole West Indian population.

Anguilla,
September 29, 1921.

ANTIMONY IN THE TREATMENT OF LEPERS AND HYDATID DISEASE.

By F. G. CAWSTON, M.D.Cantab.

THE beneficial effect of antimony is very evident when the drug is injected in the case of lepers who manifest severe paralysis, extensive ulceration or acute attacks of the disease, Not only are the outward signs of disease materially lessened, but there is a general improvement in the patient's well-being, such as is experienced when the bilharzia parasites are being destroyed by suitable doses of antimony.

In view of the impaired condition of the majority of lepers I have treated, I have confined myself to the use of colloidal preparations of antimony, given intramuscularly. In "Venereal Diseases," J. E. McDonagh states that an unfortunate thing about colloidal preparations is that "no two samples are exactly alike," p. 349; I therefore mention the source from which I obtained the supplies I found effective. In March, 1920, I obtained some striking results in the case of three out of four lepers who received from 1 to 3 c.c. of Oppenheimer, Sons and Co.'s colloidal preparation of antimony, given intramuscularly, which I had used with success in the treatment of some bilharzia cases. The most marked effect in these cases was the healing of the ulcers after only four days' treatment and the improvement of conjunctivitis after four injections. Two of the cases showed considerable improvement in the paralysis, but an early anæsthetic case manifested no change at the end of a month; intravenous injections of tartar emetic might have had the desired effect, but the patient was shortly leaving for India, and treatment was therefore discontinued.

These results were confirmed in the case of two more Indian lepers treated with larger doses of this colloidal preparation in August, 1920. One of these, Sital, showed discharging ulcers at the extremity of each finger and toe, all of which were dry at the

end of nine days, or after a total of 20·5 c.c. had been injected intramuscularly. From this and other cases it would appear that the best results are obtained where the drug is pushed until the early signs of antimony poisoning show themselves. Twelve months later, on August 17, I had an opportunity of seeing this case again, though I had heard from his district surgeon that he had remained in good health.

Although no *Bacillus lepræ* could be detected in the nasal secretion, the finger-tips were stiff and swollen, there was the appearance of a deep blister on the extremity of the left index finger, and a slight discharge on the tip of the left ring finger. I therefore injected 2½ c.c. "oscol stibium" from the same bottle, for it had remained apparently stable for over a year. Without manifesting any toxic effects, the stiffness all disappeared within forty-eight hours, the swelling had subsided, and the ulcer was dry. As this patient was leaving for India I injected 1 c.c. of Comar's colloidal preparation of sulphur and antimony, and asked the medical officer in charge of these cases to repeat the injections if further signs of leprosy should recur.

On August 19 I used the same preparation of sulphur and antimony combined in the case of a leper who manifested the acute stage of tubercular leprosy with satyriasis of the face, conjunctivitis of both eyes, and desquamation of the skin over both forearms. Dr. Lindsay Johnson, M.D., the eye specialist, kindly saw this case in consultation with me later in the day, when there was already a lessening of the acute condition of the face. Five days later the patient was feeling much better, the irritation of his forearms and his face had gone, and the eye condition had cleared up considerably. The injection had produced slight looseness of the bowels only and was repeated.

As this case has also left for India, I was unable to follow up its progress.

Dr. W. Robertson of Mossel Bay has written to tell me that he has observed return of sweating in leprous patches, whilst a leper under his care has been treated with injections of antimony.

A common parasitic affection which has until recently been treated by surgical measures alone is hydatid disease. Judging from the analogy of the closely allied macro-parasitic disease, antimony should have a similarly beneficial effect on this condition, and, although further investigations are required, the progress of a case of hydatid disease, whilst undergoing a series of intramuscular injections of antimony (colloidal) and emetine, is sufficiently encouraging to warrant a preliminary report of the treatment.

This lady of 26 contracted the infection in the Cape Province; as a child she had been closely associated with dogs. The disease is not uncommon in various parts of the Cape and Free State. Five years ago, and again three years ago, she had been successfully operated on by Dr. Pretorius of Bloemfontein for two tumours arising out of the pelvis, which Dr. Pretorius assures me were undoubtedly hydatid cysts.

On September 2, 1921, she came to me complaining of a cyst she could feel below the right costal margin. There was an eosinophilia of 16 per cent. I injected 38 c.c. of colloidal antimony and 6¼ gr. of emetine hydrochloride during the next three weeks, using from 2 to 9 c.c. of Crookes's colloidal antimony for an intramuscular injection. On September 19 the cyst appeared to be smaller and the eosinophilia had fallen to 11 per cent. By the end of September it was further reduced to 8 per cent.

X-ray examination, which showed a definite cyst at the lower border of the liver at the right costal margin when treatment was commenced, showed only an opaque shadow at the close of treatment which resembled the shadow produced in the liver of a similar case that had been successfully cured by operation twelve years before.

ADDENDUM.

I regret to see it stated that I have recommended "oscol stibium" *intravenously* for the treatment of lepers. I do not know that colloidal antimony has been used with success in the treatment of leprosy, except where it has been given intramuscularly or injected directly into a growth. In referring to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE for July 15, 1920, I see that I stated:—

"That 'oscol stibium' can be given by the mouth up to a teaspoonful three times daily without ill-effects; but that intramuscular injections are much more effective, and that intravenous injections from 1 to 4 c.c. may be given with benefit in cases of bilharzia disease."

My subsequent experience would tend to show that intravenous injections of colloidal antimony are nothing like so effective as intramuscular injections, even in a blood-parasitic affection like bilharzia disease, and it is possible that, *in the colloidal state*, antimony is excreted too rapidly from the system for the same results to be obtained as when it is given intramuscularly. If this is true in the case of parasites which inhabit the blood-stream, how much more would the principle apply to a disease like leprosy where the microbes lie largely outside the blood-stream. Wherever there is a doubt of the value of antimony in the treatment of a case, it is always best to try the effect of a few doses of tartar emetic (potassium) given intramuscularly.

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CAWSTON, F. G. and ROBERTSON, WILLIAM. "Treatment of Leprosy" (correspondence), *South African Medical Record*, August 13, 1921.

Cases of Yaws with an Eruption resembling Lichen pilaris (T. Kurita, *Japan. Ztschr. f. Dermat. u. Urol.*, vol. xx, No. 10, October, 1920).—The author describes a case of yaws which occurred on Truck Island in the East Caroline Archipelago, in which the whole body was covered with a hyperkeratosis resembling *Lichen pilaris*, appearing on faintly leucodermic spots.

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THE JOURNAL OF

Tropical Medicine and Hygiene

FEBRUARY 1, 1922.

RELATIONS BETWEEN VEGETABLE AND HUMAN PATHOLOGY.

At the meeting of the Royal Society of Tropical Medicine and Hygiene on January 19, 1922, the President of the Society, in the chair, Dr. E. I. Butler, Director of the Imperial Bureau of Mycology, read a paper on these Relations, which was followed with the deepest interest and attention by the large audience present. The subject of fungi has been a household word in the world from earliest times. The Bible records most of man's domestic afflictions and ailments, and of these the most carefully described are bubonic plague and leprosy. We know how in 1894 in Hong-Kong it was a clergyman who brought his Bible to the writer and insisted that he should listen to the description of plague as given in the 4th, 5th and 6th Chapters of the 1st Book of Samuel that led to the establishment of the scientific fact that it was the rat that brought plague to man, and that the rat flea was the medium by which it was conveyed. Thereby a series of chapters in the Book of Samuel which had been read for some thousands of years—in fact, since they were written until the year 1894 without their being understood or their meaning unfolded—came to light. Would that there could be a solution of the facts related in the 14th Chapter of the Book of Leviticus concerning leprosy, as there was in the 1st Book of Samuel concerning bubonic plague. Here mycology and a practical acquaintance with the fungi seems to play an important part, which has never yet been interpreted and rendered intelligible to present-day mycologists, nor to interpreters of the Scriptures. That it is capable of being so and yet not done is the fault not of the ancient Biblical writers, for their people followed the teaching and obeyed the regulations laid down to a nicety; but it is the Rabbis and scientists of to-day, who pay no attention to what they style a mixture of priestcraft practices, superstition, witch doctors' delusions and deceit, and so pass over what no doubt is a storehouse of accurate knowledge which will yield as reliable and useful an interpretation as did the Book of Samuel concerning plague. That account has remained before us unchanged since it was first transcribed; all other descriptions of Chinese, Hindoo, Arabic, Greek and Latin times have disappeared, until the only one left is that found in the Jewish Bible. There is no more reason to doubt the observation of the fungi that attacked the walls of the houses where lepers dwelt in early Jewish times than there is of their account of how plague was spread; and an investigation concerning these fungi with their varying colours "with hollow strakes, greenish or reddish, which in sight are lower than the wall," &c., will prove as valuable as did the perusal of the Book of Samuel after attention had been drawn to it by the clergyman in Hong-Kong in 1894 when all other references had proved abortive.

These remarks will no doubt be resented by many readers of these lines as unworthy of a scientific journal of the twentieth century. The writer makes no apology, however, for these ancient Jewish writings have withstood criticism, and to wipe away as mere fetish drivel such of these writings as cannot in the venue of knowledge of such observers be explained is but a confession of defeat in the method and manner of investigation and observation, and does not carry weight with those who are not aware that any Biblical statements have ever proved false when followed to the bedrock of scientific investigation. The fungi are

the earliest forms of organisms recorded; they in many instances could be seen by the naked eye whilst yet microscopy was unheard of. The damp on the wall of the house is evidenced by fungi to-day, the paper is altered in colour and falls off, the plaster breaks away, and decay is declared as fungi appear, and the housewife dreads damp, knowing that disease in various forms accompanies and follows after. The blame is placed upon the dampness, but just as the rat flea is the active agent in spreading plague from the rat to man, so between the damp in the walls, the beds and the clothing and man, there is a possible intermediary—fungi which may play a part in the spread of diseases of which leprosy may be but one of many ailments. We are well acquainted with many diseases due to infection by fungus in tropical countries. The fungus of Madura foot; the ray fungus, the actinomyces, and a multitudinous and an ever-increasing multitude of disorders due to fungi have set their mark at last on our growing recognition of this section of study and has evidenced its importance by the fact of the appearance of this lecturer for the first time at the Royal Society of Tropical Medicine and Hygiene—namely, the Director of the Imperial Bureau of Mycology. There is no going back on this step. The science of botany we were first introduced to at the very threshold of medicine, and in the class of materia medica the importance of a knowledge of botany was made apparent to us. Here we found the basis of our acquaintance with drugs and their sources, and later we acquired the art of administration of the potent remedies which enter into our daily prescriptions. This has become so familiar to us that we have forgotten what we owe to botany in the shaping and making us "doctors." Now we are face to face with botany in another aspect—namely, the actual diseases which we acquire from the vegetable world. In our "forensic medicine" classes we were made acquainted with many vegetable derivatives which make up an enormous number of our poisons, so that botany, botany, botany has gradually widened in its scope of application to medicine until it would seem that as we learnt our elementary physiology and anatomy from our early class in botany, and were thereby prepared to understand more readily our physiology and anatomy classes, our materia medica classes our forensic medicine classes, so now our elementary studies on plant diseases serve as an "opsonin" to prepare us for the study of pathology.

By the medical student of past years the botany class was regarded for the most part as a frivolous hour, the professor as a pseudo-serious adjunct to the medical staff, and the whole as an extra of unrecognizable value. Students of the future have a different prospect. Botany becomes a subject in extent and in importance equal to, if not more essential to be intimately acquainted with, than any of the preliminaries to a study of medicine. It can no longer be taught in a summer session of some twelve weeks; the student should have a two years' course during winter and summer before taking up medicine. He should be encouraged to enter these classes when he has gained the school leaving certificate, and from 14 to 16 devote his studies to botany and chemistry and nothing else, except perhaps electricity. During the period he will be familiarized with microscopic work in all its bearings, he will have acquired a knowledge of cell development life, staining, &c. We are supposed to all understand the importance of this nowadays, and it is only the necessity of insisting on its early application to the studies of those who intend to be doctors that we are anxious to see brought home to the profession. The intending student of medicine should have his career mapped out for him early, certainly by the time he is 13 or 14. He should be in a position at 16½ to study human anatomy and physiology, and he should be qualified when he is 21. To start later a five years' course of medicine for a degree will, in his father's opinion, necessitate his keeping his son far into the 20's of his life, a point which involves an expenditure of money which will debar many a lad from taking up medicine owing to the fact that his father cannot afford it, seeing the state of commercialism the world has reached in modern times.

Dr. Butler, in his paper, referred to "the virus in contagium diseases," spoken of by plant pathologists of to-day. These diseases were constitutional, the virus reaching all parts of the plant within a few days. Carriers had been found—that is to say, plants which showed no symptoms after inoculation, yet contained the infective virus in transmissible form. The disease was not usually fatal to annual plants. Mosaic and allied diseases of potato in England might cause a reduction of as much as over 50 per cent. in the yield.

As regards transmission of disease, in no case had transmission by mere contact been demonstrated. The medium of conveyance of disease is believed to be by sucking insects from plant to plant, but plants, flowers, &c., are open to many varieties of animals—birds, field vermin, &c. The sources of infection are no doubt more plentiful than in the case of man and animals, and they may add directly to increase in both man and animals in regard to disease, and indirectly by the way of diseased food or insufficient food owing to the diminution of the crop in bulk or quality owing to infection from pathological viruses and cells.

Annotations.

Cerebrospinal Fever in Hong-Kong (1918) (A. M. Gale, B.Sc., M.D., *Journal of Hygiene*, vol. xx, No. 3, November, 1921).—There is reason to believe that sporadic cases of cerebrospinal fever occurred in Hong-Kong previous to the outbreak of the epidemic in 1918. This epidemic followed a widespread infection of influenza colds. The most susceptible age was found to be the age period

under 5 years, the younger the individual, the greater the susceptibility, with the added proviso that the extremes of life suffered most. The housing conditions in Hong-Kong are such as to necessitate the immediate action on the part of the Government to safeguard the public health of the colony. The poorest, most hard-worked and badly housed portion of the community naturally suffered most in the epidemic. It has been found that the recognition and isolation of carriers in an epidemic of any considerable dimensions is impracticable. Owing to the present knowledge of the means by which the infection is spread, the wearing of a screen composed of some impervious material, such as celluloid, would seem to afford complete protection to the wearer against droplet infection. Known carriers should be compelled to wear this screen until such time as they are proved free from the meningococcus. Thus protected, the carrier could pursue his usual avocation, and the community be safeguarded from infection at a minimum of expense

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Pulmonary Plague (H. Schut, *Geneesk. Tijdschr. v. Nederl.-Indie*, vol. lxi, No. 1, 1921).—The author reports five cases of pulmonary plague which all ended fatally, but temporary improvement was gained by the administration of intramuscular injections of digalen (1 c.c. three times a day) and neosalvarsan (0·45 grm. on two consecutive days), combined with infusion into the veins of glucose solution to prevent heart failure.

Bilharziasis amongst British Troops in Mesopotamia (Captain A. G. Harsant, *Journal of the Royal Army Medical Corps*, vol. xxxvii, No. 5, November, 1921).—The author describes thirty-one cases of bilharziasis treated with intravenous injections of tartar emetic; of these, four refused to continue their treatment after they had received one to four injections. Of the remaining twenty-seven cases only one is known to have relapsed. Sixteen of the twenty-seven cases were still free from pus and ova in their urine when re-examined four to eight weeks after discharge from hospital. On the termination of treatment all cases were entirely free from symptoms, a few were passing occasionally a few black granular ova, but none showed any ova capable of hatching out. The one case which is known to have relapsed completed a full course of fourteen injections (32 gr.), and was discharged from hospital after several negative examinations of urine. Shortly after discharge he had a recurrence of symptoms whilst on a march; ova were found in his urine only on the sixth examination. He was given three injections of tartar emetic (7½ gr.), but then refused further treatment.

Dermatitis among Workers in Cane (*Journal of Indian Hygiene*, 1921).—Dermatitis is found a great deal among workers in cane. They complain of itching, burning and slight pain which is caused by the black dust which comes from the macerated cane stalk, and which on contact with the skin is capable of producing dermatitis of the forehead, cheeks, eyelids, nose, the lateral parts of the neck, backs of the hands and scrotum.

Bacillus proteus in Cerebro-spinal Fluid of Typhus Fever (J. M. Anderson, *Journal of Pathology and Bacteriology*, October, 1921).—The author describes two cases of typhus in which the blood examination for malaria parasites and spirilla of relapsing fever was negative, as also were agglutination tests with *B. paratyphosus* A., B. and C. A positive Weil-Felix with *Bacillus proteus* x 19 was obtained from both. An organism was grown from the cerebro-spinal fluid which appeared to be *B. proteus;* though no agglutinating serum for *B. proteus* was obtainable and the classification of the organism is incomplete, it was concluded that *B. proteus* had been isolated from two cases of typhus fever with meningeal signs.

Immunization Experiments with Larvæ of Galleria mellonella (C. R. Hebdon, *Acad. Sci.*, Paris, 1921).—The author is of the opinion that anaphylactic shock is the result of a too rapid cellular reaction stimulated by immunization, and describes his experiments with the larvæ of *Galleria mellonella*.- These larvæ become immunized against infection with cholera within three hours after the injection of the vaccine. Although treated larvæ are immune to the minimum fatal lose, thoy seem to succumb more rapidly to larger doses than the untreated larvæ do.

Occurrence of Tularæmia in Nature as a Disease in Man (E. Francis, *Public Health Reports*, Washington, July, 1921).—The author describes several cases of tularæmia occurring in Utah during 1919-20. The disease is caused by the bite of an insect, probably *Chrysops discalis*, and usually appears during the months of June, July and August. The causal agent is *Bacterium tularense*, and the fly acquires the infection by biting jack-rabbits suffering from the complaint. *B. tularense* was also isolated from lesions produced in guinea-pigs by inoculating them with cultures prepared from ground squirrels suspected of harbouring the disease.

The Influence of Inorganic Iron on the Regeneration of Blood after Hæmorrhagic Anæmia (John H. Musser, Jr., M.D., *Archives of Internal Medicine*, vol. xxviii, No. 5, November, 1921).—After hæmorrhagic anæmia in otherwise normal dogs, under standard conditions, dogs receiving iron in two of four experiments regenerated blood more rapidly than their controls during the early stages; but both test and control dogs attained figures approximately normal in about the same time interval. In

the other two studies regeneration is seen to be more rapid and complete in the control dogs, particularly when the blood counts are analysed in relation to the blood volume changes. It is concluded that the administration of inorganic iron cannot be said to produce any constant alteration in the course of an experimental hæmorrhagic anæmia.

Variation of the Phenolsulphonephthalein Excretion with the Urine Volume in Chronic Interstitial Nephritis (R. R. Snowden, M.D., *Archives of Internal Medicine*, vol. xxviii, No. 5, November, 1921).—In cases of chronic interstitial nephritis, showing functional impairment as regards phenolsulphonephthalein, there is a retardation and prolongation of the excretion of the dye.

This retardation is the earliest indication of functional disability. As impairment becomes more marked the retardation becomes more pronounced. In most cases of marked functional impairment, the excretion of the phenolsulphonephthalein varies more or less directly with the volume of urine, and in these cases the phenolsulphonephthalein output is materially increased when the flow of urine is stimulated by giving water.

Comparative Studies in the Chemistry of Blood and Cerebro-spinal Fluid (Grete Egerer-Seham, Ph.D., and C. E. Nixon, M.D., *Archives of Internal Medicine*, vol. xxviii, No. 5, November, 1921).—The creatinin value in normal spinal fluid varies from 0·45 to 2·20 mg. for 100 c.c. of spinal fluid.

The ratio between creatinin or normal spinal fluid and blood reveals the existence of a still greater variability than for sugar.

The ratio between creatinin of pathologic spinal fluid and blood is not sufficiently constant to justify clinical application.

The average value for urea in 100 c.c. of normal spinal fluid is 9·87 mg.

The urea content of cerebro-spinal fluid in cerebro-spinal syphilis shows a slight increase over the normal.

The average ratio of urea of normal spinal fluid and blood is 62·15 per cent., this ratio being slightly increased in diseases of cerebro-spinal involvement.

Under normal conditions the carbon dioxide carrying capacity of the cerebro-spinal fluid is somewhat lower than that of blood, while in acidosis it is greater in some instances at least. Whether or not this indicates the operation of a mechanism for the protection of the nervous system is not yet clear.

In the cerebro-spinal fluid in syphilis no constant deviation from normal is encountered in sugar creatinin or urea content, in acid base equilibrium, in specific gravity, or in anzymatic activity.

Spirochætosis Bronchialis (G. Korthof, *Geneesk. Tijdschr. v. Nederl.-Indie*, vol. lxi, No. 1, 1921).—The author describes six cases of bronchial spirochætosis occurring in the Dutch East Indies, where the malady is very common. One of the cases was complicated by tuberculosis, and one showed all the clinical symptoms described by Castellani, the other four were of a mild nature. The author used Becker's method for staining the spirochæte. Fix the smear during one minute in formalin, 10 per cent.; acetic acid, 5 per cent.; heat the slip while covered with 10 per cent. tannin solution and stain with carbolfuchsin, when the spirochæte will show a brilliant red colour.

Treatment of Refractory Malaria (J. L. Peutz, *Nederlandsch Tijdschrift v. Geneeskunde*, Amsterdam, August, 1921).—The author describes a case of malaria in a man aged 31, in which no benefit was obtained from treatment by quinine, neoarsphenamin, or methylene blue; in fact, they appeared to make the attacks worse. After the application of Röntgen rays to the spleen the attacks stopped. Five applications of the rays were given in all, and up to the present time (six months later) no symptoms of malaria have appeared.

Abstracts.

THE SPREAD OF BACTERIAL INFECTION.[1]

By W. W. C. Topley, M.A., M.D.

The important rôle played in the spread of epidemic disease by the re-accumulation of a susceptible population is clearly indicated. It seems not unreasonable to hope that valuable information as to the effect produced by variations in the rate of such re-accumulation, and on other matters, may be obtained by the satisfying method of direct experiment. The bearing of such information on the well-known fluctuations in the incidence of epidemic diseases, and especially, perhaps, those which fall most heavily on children, are too obvious to need emphasizing.

The following conclusions seem permissible at the present stage:—

(1) If susceptible mice be continuously added to an infected population the spread of infection will continue over a long period of time. There is no evidence that this period has a limit.

(2) When susceptible mice are added continuously and at a constant rate to an infected population the spread of infection, as judged by a mortality curve, is propagated in regularly recurring waves. These waves are most easily observed by noting the fluctuations in the total cage-population. It seems probable that the period of these fluctuations will be found to depend on the rate of addition of susceptible individuals, but this point has still to be determined.

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[1] Abstracted from the *Journal of Hygiene*, vol. xix, No. 4, March, 1921.

(3) The actual deaths may occur in large groups, with intervals during which deaths are few and far between, or they may fall in a succession of smaller groups, increasing and diminishing in size to form the larger waves. In all cases there is a tendency for the occurrence of such small groups of deaths with definite maximal points. There would seem to be two fluctuating processes, the one superimposed upon the other.

(4) The average survival-time of mice added to the cage, and their chance of ultimate survival, if no more susceptible mice are introduced, vary according to the phase at which they are added. If they gain entrance to the cage during the rise of a wave they are unlikely to live for long. If they are introduced during the fall of a wave their chances of survival are greatly increased, and they will usually outlive mice which are added at a later date, but at a time before the commencement of the next wave.

(5) The rate of extinction of a population, among which the infection is actively spreading, will be far less rapid if they are kept isolated than if further susceptible individuals continually gain access to them. A proportion of the infected population, which would have survived indefinitely under the former circumstances, will die under the latter.

(6) The ultimate survivors among such a population have not escaped infection, but have successfully resisted it. A considerable proportion of them are harbouring the causative parasite in their tissues.

NOTE ON A CASE OF LEPROSY.[1]

By W. Yorke and S. Adler.

The patient was a native of Hong-Kong, aged 45. Came to the out-patient department of the Tropical School, Liverpool, July 29, 1921, complaining of feeling ill, ulceration of face and generalized skin eruptions.

Present Condition.—The appearance of the face at once suggested leprosy. Both alæ nasi were swollen and ulcerated, and there were fairly well-developed nodules on the chin, forehead and cheeks. There was an extensive raised, ham-coloured rash on the arms, forearms, trunk and legs. The affected areas of skin were not anæsthetic, except on the outer side of the right leg. No thickening of the superficial nerve trunks was observed. Scrapings from the skin lesions and from the alæ nasi showed very numerous *lepra bacilli*.

History.—The most interesting feature of this case is its history. The patient arrived in England in 1912 in good health, and has been employed until a short time ago as a laundryman in Cardiff. It was not until 1916—four years after coming to England—that he first noticed small spots on the left side of the face. No further change was observed until twelve months ago, when the ham-coloured eruption appeared on the trunk and upper and lower limbs. Five months ago he noticed for the first time the swelling of the alæ nasi.

There is no evidence that the case had been diagnosed before he came to the hospital; the patient and his friends were quite unaware of the fact that it was leprosy.

[1] Abstracted from the *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 3. September, 1921.

THE ACTION OF "BAYER 205" ON *TRYPANOSOMA EQUIPERDUM* IN EXPERIMENTALLY INFECTED MICE.[1]

By C. M. Wenyon, C.M.G., C.B.E., M.B.

Though many drugs have been tried in the treatment of trypanosomiasis in man and animals, it is generally admitted that none of them is entirely satisfactory, although cases of the human disease have undoubtedly recovered after their prolonged use. In experimentally inoculated small animals, such as mice, it is usually possible, by means of a single dose of a drug, to bring about the disappearance of the trypanosomes from the peripheral blood, but almost invariably relapses occur in a comparatively short time, and the animals die of the infection.

Haendel and Joetten (1920) and Mayer and Zeiss (1920) published accounts of the trypanosomicidal action of a drug which they referred to as "Bayer 205." They reached the conclusion that the preparation possessed trypanosomicidal powers on various pathogenic trypanosomes in small laboratory animals.

The author was given a sample of the drug for trial, and it was tested on a very virulent strain of *Trypanosoma equiperdum* in mice.

The animals were inoculated intraperitoneally from another heavily infected animal. In forty-eight hours the blood showed very heavy infections, and if left untreated the animals died on this or the following day. In all cases the drug was given forty-eight hours after inoculation by the intravenous route when trypanosomes were swarming in the blood. It was found that a dose of 0·0025 grm. per kilogram of body-weight would cause the trypanosomes to disappear, but that relapse occurred in about one week, the animals then dying of very heavy infections two or three days later. A dose of 0·005 grm. per kilogram of body-weight, however, was not followed by any relapse during ten weeks' observation. The mice were quite healthy, and it may be fairly safely assumed that the minimal dose required to produce this apparent *sterilisans magna* in mice lies between 0·0025 and 0·005 grm. per kilogram of body-weight if the drug is administered intravenously.

This dose does not indicate the limit to which one can go. It is possible to give a mouse with a heavy

[1] Abstracted from the *British Medical Journal*, No. 3,175, November, 1921.

infection as much as 0·5 grm. per kilogram of body-weight. With this high dose there is, however, a definite and immediate reaction, and some of the animals succumb to its toxic effects within twenty-four hours. With half this dose (0·25) the reaction is slight. The action of the drug is not immediate. The trypanosomes disappear gradually from the blood during the forty-eight hours following the injection.

"Bayer 205" thus has a remarkable action on the trypanosomes in that in every instance a single injection of a suitable dose apparently brought about a *sterilisans magna*, and this in a dose considerably lower than that which can be given without killing the animals. There seems every reason to believe that this drug, whatever may be its constitution—and this has not yet been made public—will be found to be a more efficient remedy than those hitherto used in cases of human and animal trypanosomiasis, if not in other diseases, such as kala-azar.

Current Literature.

THE AMERICAN JOURNAL OF TROPICAL MEDICINE. Vol. I, No. 4, July, 1921.

Relapsing Fever in Panama. The Human Tick, Ornithodoros talaje, demonstrated to be the Transmitting Agent of Relapsing Fever in Panama by Human Experimentation (L. B. Bates, L. H. Dunn, and J. H. St. John).—Two white rats were infected with relapsing fever by inoculating them with a suspension of macerated naturally infected ticks, *Ornithodoros talaje*. Typical spirochætes have been found in naturally infected ticks in Panama. One monkey, *Macacus rhesus*, was infected with the relapsing fever of Panama by feeding a number of larvæ (*O. talaje*) upon an infected white rat, and twenty-two days later allowing the same ticks as first stage nymphs to feed on the monkey. Three human beings, volunteer patients, were infected with relapsing fever as follows:—

(1) The first by a subcutaneous injection of blood from a white rat which had been infected with relapsing fever by a combined subcutaneous and intraperitoneal injection of naturally infected ticks.

(2) The second by a hypodermic injection of a suspension of naturally infected ticks.

(3) The third by being bitten by naturally infected ticks.

The Cultivation of Trichomonas hominis (Mary J. Hogue).—On April 7 a stool containing *Trichomonas hominis* was sent to the authoress for examination. Several test-tubes of different kinds of media were inoculated with the material by means of a sterile platinum loop and incubated at 35° C. On May 4 a single individual was isolated from the general culture and used to start a "pure line" of Trichomonas. A very simple method was used to isolate the pure line. Small drops of the medium in which the Trichomonas were not very plentiful, i.e., young or old cultures, were placed on cover slips, which were then inverted over depression slides and examined. Trichomonas is plainly visible under the high dry objective. When the drop was found to contain only one Trichomonas the corners of the cover slip were cut off with scissors, and the remaining small piece of glass with its single Trichomonas was dropped into a test-tube containing Locke-egg medium. This was then incubated at 35° C., and in a few days the medium was swarming with Trichomonas. The pure line as well as the general stock culture are now both in a normal condition after more than eight weeks of cultivation on sterile media. Transfers to a new media are made every second, sometimes every fourth day, depending on the general condition of the cultures. All cultures are kept in a constant temperature chamber at 35° C.

A Contribution to the Study of Mycetoma in North America (M. F. Boyd and E. D. Crutchfield).—The type of fungus infection of the extremities known as mycetoma is comparatively rare in North America. It is relatively more common in the tropics and sub-tropics than in the temperate zone, and apparently more common in semi-arid regions than elsewhere. The majority of the reported cases have occurred among Mexicans (probably Indians). Its onset may occur at any age period, though it is most common between the ages of 20 and 30. The occurrence of a case in a woman is very unusual. Most of the cases are labourers by occupation, and of these the majority are engaged in agricultural pursuits. The other cases, regardless of occupation, appear to have led quite active lives out of doors.

Local treatment is of no value as a curative measure or in checking the progress of the disease. Neither is internal medicine any use. X-ray may possibly delay or check the disease at the stage in which it is seen, but even if it is checked the member would remain practically functionless. Early amputation offers the best solution to the treatment of the disease.

INDIAN MEDICAL GAZETTE. Vol. LVI, No. 10, October, 1921.

A Typhus-like Fever in India, possibly Transmitted by Ticks (Lt.-Col. J. W. D. Megaw, B.A., M.B., I.M.S.).—McKechnie's investigations have shown that a fever clinically similar to typhus exists in Sat Tal and Bhim Tal. He found it hard to reconcile the occurrence of typhus in these places with what is known of the epidemiology of typhus, but he was forced to the conclusion that the disease was really nothing but typhus. The author's personal experience and a consideration of the available evidence has led him to form a strong suspicion that the disease is one affecting the animals of the jungle, and that it is conveyed to man by a tick, and that the disease is either the same as Rocky Mountain fever, or at any rate closely related to it. The disease is probably widely distributed in India and other parts of the

world, but remains unrecognized because of its superficial resemblance to typhoid fever.

Systematic research by a medical entomologist and pathologist is urgently needed to clear up the doubtful points in connection with the disease, which will probably be easily preventable when the source of the infection is demonstrated.

In the meantime it would appear to be worth while to take precautions against tick bite in the affected localities on the lines that have proved successful in the Rocky Mountains.

A Note on the Twelve-day Fever of Nigeria (Lt.-Col. J. W. D. Megaw).—The author is interested to note that a description has been published in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE for July, 1921, of fever closely resembling that described by himself in this magazine. The article is entitled "Notes upon the Occurrence of a Twelve-day Fever of Dengue Group in Nigeria," by Dr. Wynne Davies and Mr. Johnson, F.R.C.S. The author thinks this paper is a most valuable one, but is of the opinion that the facts so clearly stated by the authors are capable of an interpretation quite different from the one arrived at by them. Megaw points out the difference between dengue fever and the fever under discussion, its close resemblance to typhus, and emphasizes the fact that as it is not louse-borne it may possibly be transmitted by ticks. It would be interesting should it turn out that tick-borne typhus occurs in such widely separated places as the Rocky Mountains, the Himalayas, and Nigeria.

The Formol-gel Test in Kala-azar (Lieut. E. C. Fox, I.M.D., and Major F. P. Mackie, I.M.S.).—The authors are of the opinion that if the formol-gel test will enable them to distinguish kala-azar from malaria it will be very valuable, but there are already signs to indicate that this may turn out to be a source of error. They have devised a simple technique by which the test may be applied by the general practitioner with the minimum of equipment.

Collect the blood from the finger in a Wright's capsule, just as is done for the Widal reaction for typhoid fever. When the serum has separated from the clot, take one drop and place it on a slide. Invert the slide over a watch glass containing a few drops of commercial formalin, the vapour from which will arise and act on the drop of serum. In cases of kala-azar the serum will solidify in a few minutes, whilst other sera will remain fluid and unaffected. The solidified serum is opaque, and is in the condition of a stiff jelly which adheres to the slide, whilst the serum in negative cases will run off the slide when it is tilted. The jellying of syphilitic serum is, as already stated, a much slower process, and is not likely to cause confusion with kala-azar.

Iodine Injections for Septic Conditions (A. Bayley de Castro).—In the Andaman Isles, during the monsoon weather, ulcerative processes of various gradations, from the simple punctured "angry-looking" to the extensive phagadenic type, are by no means uncommon. The author tried treating with salol locally and tincture of iodine intravenously in alternate cases. The results were most gratifying, but were quicker, more far-reaching, and had greater beneficial action with the iodine than the salol. The doses were injections of tincture of iodine, 5 minims in 1 c.c. normal saline solution, and going up to 20 minims in 10 c.c. The injections in bad cases were given every day, in ordinary cases every second day.

THE INDIAN MEDICAL GAZETTE. Vol. LVI, No. 11, November, 1921.

Kala-azar: Notes on the Diagnosis and Treatment (L. E. Napier, M.R.C.S., L.R.C.P.).—There are three principal foci for kala-azar in India—namely, Bengal, Assam and Madras. The clinical manifestations of the disease vary somewhat in these three districts, but the response to treatment is uniform. The disease is very prevalent in Calcutta and the surrounding districts. Of the patients who apply for treatment at the kala-azar clinic at the Calcutta School of Tropical Medicine, about 70 per cent. are found to be definite cases of kala-azar, diagnosed by the finding of Leishman-Donovan bodies in the material obtained from their spleens by "spleen puncture." Both sexes are equally liable to the disease, and the disease appears to be equally common amongst Hindus, Mohammedans and Christians. Possibly the poorer class of Christian is most commonly attacked. Childhood and adolescence are reputed to be the ages most liable to the disease, but this does not appear to be the case in Calcutta. The best treatment for these cases is potassium antimonyl tartrate by intravenous injections, which should be given three times weekly, starting with doses of 1 c.c. and gradually increasing to 10 c.c.

Notes on Thirty-five Cases of Snake Bite (M. M. Hazra).—Antivenene is the specific remedy against the venoms of the cobra, krait, and some of the viperines. It is capable of neutralizing venoms when present in the blood-stream. The efficacy of this drug depends on the freshness of the preparation and the shortness of the interval between the bite and the administration of the drug. Intravenous injections are more prompt and reliable than other methods of administration, but this can surely save life even when toxic symptoms have developed to a considerable extent. If symptoms do not subside with one injection, repetition, at short intervals, is necessary. Potassæ permanganas is a drug also capable of neutralizing the venom locally. Subcutaneous injections are more efficacious than simple rubbing. Iodine is a reputable drug for viperene toxæmia when thrombosis is developing in the system. Injection of this drug into the vein relieves pain and localized swelling and brings about speedy recovery. Its intravenous injections are free from trouble and danger.

All the remedies are hopeless after complete fixation in the brain and nerve cells.

Septic Gastritis in Kashmir (M. J. Roche, M.C., M.B., B.Ch.).—Pyorrhœa alveolaris is very pre-

valent in Kashmir and is the chief cause of pain in the stomach. Another common cause is worms, i.e., the ordinary round worm and tape worm. These, of course, usually affect children, and must be carefully excluded before deciding on any line of treatment for abdominal pain in such patients. The former cause is responsible for at least 80 per cent. of the adult patients complaining of pain in the upper part of the abdomen, and there is no doubt that if pyorrhœa alveolaris could be removed from Kashmir the amount of suffering and indisposition for work would be enormously removed. The treatment of pyorrhœa alveolaris consists in painting the gums with tincture of iodine on three or four successive mornings after having first got an assistant to remove by brush or scraping as much filth as possible from the mouth. A simple tooth paste should be used on these and following days, especially at nights before retiring to bed.

Thymol in Uncinariasis (P. Gupta, M.B., and J. C. Guha).—This paper deals with the result of 146 cases of hookworm infection treated with thymol at the Patna Lunatic Asylum in 1919 and 1920. Thymol should be administered in cachets emulsion or in sugar, as pure thymol is likely to cause irritation of the throat. The drug is obtained as a crystalline substance from the volatile oils of *Thymus vulgaris*, *Monarda nuctata*, and *Carum copticum*. It is soluble in cold water 1:1,500, in glycerine 1:150, and in olive oil 1:2, and freely in alcohol, ether and chloroform. The dose varies between 1 and 2 dr. daily in a single dose or divided into two or three doses. Out of the 146 cases treated, 62·46 per cent. were cured, and no single case of poisoning occurred. The rate of cure would have been still higher had it been possible to prevent reinfection even during the course of treatment, as many of those not cured were lunatics and demented.

Hæmorrhagic Meningo-encephalitis in Anthrax (Captain B. Shanks, I.M.S.).—The author describes a case which illustrates the characteristic and interesting hæmorrhagic lesions which occur in the meninges and brain as a result of their infection with the bacillus of anthrax. The infective agent in such cases can be readily obtained from the cerebrospinal fluid withdrawn before death, or from the hæmorrhagic exudate on the surface of the brain post mortem. In this case an anthrax bacteriæmia resulted from a malignant pustule of the face, and gave rise to secondary lesions in the brain, intestines and parotid.

Medical News

EXAMINATION IN TROPICAL HYGIENE FOR SANITARY INSPECTORS.

The Council of the Royal Sanitary Institute have had for some while under consideration the question of establishing an Examination in Tropical Hygiene suitable for sanitary inspectors. At present it is proposed to hold the examination in London, but it will probably also be arranged in connection with the Institute's Examination Boards in the different parts of the Empire. Particulars can be obtained from the Secretary, The Royal Sanitary Institute, 90, Buckingham Palace Road, London, S.W.1.

THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

At the meeting of the Society, held at 11, Chandos Street, Cavendish Square, on Thursday, January 19, at 8.15 p.m., preceded by a Demonstration at 7.45 on "Some Stages in the Development of *Trypanosoma lewisi* of the Rat," by Dr. A. C. Stevenson.

The following papers were read: (1) Dr. E. J. Butler, Director of the Imperial Bureau of Mycology, on "Some Relations between Vegetable and Human Pathology." (2) Dr. W. Salisbury Sharpe, M.R.C.P., F.R.C.S., on "Diseases of the Ear in Relation to Life in the Tropics." (3) Short papers presented to the Society: (*a*) Infectious Abortion in Cattle in Rhodesia," by L. E. W. Bevan, M.R.C.V.S., of the Veterinary Laboratory, Salisbury, Rhodesia; (*b*) "A Simple Container for the Transport of Small-pox Vaccine in the Tropics," by H. Lyndhurst Duke, B.A., B.C., M.D., Bacteriologist, Entebbe, Uganda Protectorate.

The following were admitted as Fellows of the Society: Bacot, Arthur William, Lister Institute of Preventive Medicine, London; Balfour-Browne, W. A. F., M.A. (Oxon. et Cantab.), F.R.S.E., F.Z.S., Lecturer in Zoology, Univ., Cambridge, Barrister-at-Law; Bardhan, Sarogini Nath., B.A., L.M.S., D.T.M., Rai Sahib, Govt. Pathological Laboratory, Sepoy Lines, Singapore; Birdary, Abd El Aziz (Graduate, American Univ., Beirut), Cairo; Carter, Henry Francis, Government Malariologist, Ceylon, Colombo, Ceylon; Carter, Major Herbert St. Maur, D.S.O., M.D., B.Ch., B.A.O., Univ., Dublin, R.A.M.C., Bombay; Clemesha, Colonel William Wesley, C.I.E., M.D., D.P.H., I.M.S., London; Dudley, Surg.Commander Shildon Francis, O.B.E., M.R.C.S., L.R.C.P., D.P.H., D.T.M., M.D., B.S.Lond., R. N. College, Greenwich; Grenier, Frank, M.D.Edin., D.T.M. and H. Camb., Colombo, Ceylon; Harris, J. C. N., M.R.C.S., L.R.C.P., Khartoum, Sudan; Humphreys, Roy Mervyn, B.M., B.Ch.(Oxon), Medical Dept., Sudan Govt., Khartoum, Sudan; Jackson, John William, M.B., C.M.Glasgow, London (late of Shanghai; Lamborn, William Alford, M.R.C.S., L.R.C.P., Zomba, Nyasaland; Mitchell, Andrew Henry, M.B., Ch.B., Aberdeen Univ., Colonial Medical Service, Kenya; Philip, W. Marshall, M.B., C.M., D.P.H., M.O.H., Colombo, Ceylon; Tripp, C. Llewellyn Howard, M.R.C.S., L.R.C.P.Lond., L.S.A., Exeter.

The next meeting of the Society will be held at 11, Chandos Street, on Thursday, February 16. A paper will be read on "Relapsing Fever," by Major F. W. Cragg, M.D., I.M.S.

Original Communications.

CARE AND TREATMENT OF THE EAR IN THE TROPICS.

By W. Salisbury Sharpe, M.D., M.R.C.P., F.R.C.S., D.P.H., D.T.M.&H.,

Assistant Surgeon Central London Throat, Nose and Ear Hospital.

In proportion to their admitted frequency, the large amount of incapacity caused by them and their not infrequently dangerous complications, diseases of the ear appear to have received relatively little attention from medical men residing and practising in the tropics.

In drawing attention to the incidence and progress of aural disease in the tropics among Europeans, it is first of all necessary to ensure that persons in whom the beginning of aural disease can be found should not be recommended for tropical appointments.

It is now the general custom that Corporations which send out Europeans to carry on commercial or other kindred enterprises in tropical countries submit such persons for examination to medical men in this country for the purpose of ascertaining their physical fitness to withstand the changed and often trying conditions of tropical life.

In the course of such examination I submit that a test of the hearing power and inspection of the ears is at least as important as testing the vision and inspection of the eyes; in fact, rather more so, since a proportion of ocular defects may be neutralized by the use of glasses, whereas no such convenient and ready help is available for the ear.

It may, therefore, be well for the guidance of those at home, whose duty it is to examine candidates for tropical service, to make certain recommendations as regards methods of examination and standards to be attained.

This question presents many difficulties, so that a standard of what constitutes normal hearing power can neither be laid down with accuracy nor applied with rigidity. It must be borne in mind that the acuteness of sound perception in a perfectly normal person is subject to great variations, not only on different days, but also at different times on the same day. It may even vary within a very short time, and is also influenced by the temperature and humidity of the atmosphere and by upward, downward, or horizontal movements or currents of air, and by the direction of horizontal ones, also by variations in the condition of the patient, e.g., excitement, fatigue, &c.

Apart from anything which could be called deafness, perception of the highest tones physiologically decreases with age. There are also wide individual variations among normal people.

The usual limits for simple tones are from about 30 to 30,000 vibrations per second, a few can hear as low as 16 or as high as 50,000, or even higher. Most people hear up to between 20,000 and 24,000 in youth and about 15,000 in middle age. Everyone is familiar with the fact that the size and shape of rooms and the extent of communication, if any, with the outside air affect the conduction of sound, not to mention the disturbance caused by noise. In testing by speech, it must be remembered that vowel sounds are heard farther than consonants, and that A E and I are heard farther than O and U, and that the consonants also vary in like manner.

The difference in the volume and timbre of the voice in different individuals, both for ordinary conversation and for whispered speech, is an important factor in influencing the precision of testing the hearing for speech. Another important factor is the impossibility of speaking always with the same strength of voice, even with the most careful practice.

The results of testing the hearing for speech are therefore not of absolute, but only of relative value.

Elaborate tables have been constructed to show the distance at which the several letters of the alphabet should normally be audible. They are shown to vary from Ah at 280 metres to H " aspirate " at 10 metres.

As a matter of everyday practice, if a person fails to hear clearly the spoken voice in an ordinary conversational tone at any distance available within the limits of any ordinary consulting room, the room being closed and reasonably quiet, his hearing may be considered to be defective and further investigated accordingly.

The usual method of examination of hearing power is, firstly, to ask the candidate the several questions to which answers are required to be written in his report. The questions being asked in a clear, but purposely not loud tone, his position being such that he cannot see the examiner's lips (so that he has no chance of lip reading), and such also that he cannot see the paper on which the examiner is writing in case he reads the question and so knows what answer is expected.

He should then be placed at a distance 15 to 20 ft., and caused to stop up one ear either by pressing the tragus backwards over the external auditory meatus or by moistening the forefinger and inserting it into the meatus in such a way as to produce complete occlusion.

The examiner then conceals his own mouth by holding one hand in front of it but a few inches away, and having instructed the candidate to repeat after him whatever he hears said, whispers a few words, or a short sentence or a number as a test. Should the test words not be heard, the examiner takes a pace forward and repeats it, or says something else, and so on, till a distance is found at which a whisper is heard and correctly repeated, and this distance noted.

Should a whisper not be heard even close, a normal speaking voice is tried in the same way.

The usual practical standards are:

Whisper, 40 to 45 ft.; speaking voice, 100 to 150 ft. Permissible defect: Whisper, 10 to 15 ft.; speaking voice, 40 to 60 ft.; ie., a normal person can hear numbers whispered at the full length of

an ordinary-sized room if it is fairly quiet and the windows are closed.

Whether the hearing power be below normal or not, it is necessary to make some examination of the ears.

In some individuals the membrana tympani can be clearly seen by ordinary daylight merely by pulling the ear a little upward and backward. In others, owing to the narrowness and curvature of the meatus, it is difficult to see even with a powerful lamp and a head mirror and speculum. No inspection of an ear can be considered as satisfactory unless the tympanic membrane has been seen.

The following points are to be noted:—

(1) The presence or absence of accumulated wax.

(2) The presence or absence of pus.

(3) The presence or absence of granulations or polypi.

(4) The presence or absence of perforation of the membrane.

(5) If perforation be present, its size and position.

(6) If perforation be present, the condition of the interior of the tympanic cavity as seen through it.

(7) If no perforation be present, the condition of the membrane, e.g., adherent to inner tympanic wall, loose and baggy, bulged, indrawn, bloodshot, scarred, &c.

Should the hearing power by voice tests prove to be below normal, it will be well to undertake the following simple tests to obtain further information:—

Watch.—Watches vary much in strength of tick. A chronograph is best, especially if it can be started and stopped without any audible click, as it is easy to tell when such a watch is heard and when it is not heard.

The candidate should be unable to see the hand which holds the watch, to avoid his being guided at all by the distance at which it is held.

The standard instrument for this test is the acoumeter, which gives a ticking sound which should be audible at 15 ft.

Tuning Fork.—For the purpose in hand, elaborate tests are not required; but in case hearing is found to be defective, a tuning fork is desirable for the following purposes:—

(1) *Weber's Test*.—The tuning fork is struck and placed on the vertex. In obstructive deafness it is heard best in the deaf ear.

(2) *Bone Conduction*.—The fork is struck and then placed with its stem in contact with the mastoid process. On its ceasing to be heard, the candidate signals that fact, when the fork is immediately transferred to the mastoid of the observer, and if it can be heard by him, the duration in seconds of the time it can be so heard is noted and recorded thus, e.g., L. ear B.C.—20 seconds.

Tuning forks are used rather for working out detail than for ascertaining the presence of defect.

Rinné's Test.—In this the fork is placed on the mastoid as before, but when it ceases to be heard there, the prongs are held near the auditory meatus, when, if the ear is normal, the sound will again be heard for some time—15 to 25 seconds.

In abnormal conditions the fork may be heard much longer on the mastoid than opposite the meatus. When the bone conduction is thus greater than the air conduction (Rinné reversed), the indication is that the deafness is due to some defect in the conducting apparatus and not in the auditory nerve.

High tones are better observed in obstructive, and low tones in nerve deafness.

Visual Indications of Abnormality.

(1) *Wax*.—If this be present in such quantity or position as to preclude an adequate view of the tympanic membrane, whether hearing is impaired or not the wax should be removed, as cases are not uncommon in which disease of the middle ear is concealed by the presence of apparently hard wax. If, when the wax has been removed, the ear appears normal, and hearing power is also normal, the candidate may be passed.

If syringing has had to be resorted to, the hearing tests should be deferred to another occasion, as hearing power is not at its best immediately after syringing.

(2) *Suppuration*.—Suppuration in 99 per cent. of cases is from the middle ear and should cause prompt rejection. It is, however, amenable to treatment which should at once be undertaken in order to save the hearing, &c.; but though it may recover so completely as to pass later, this result is uncommon, and hope should not be held out.

Polypi usually indicate that the suppurative condition is of long standing. Granulations are only present in suppurative cases, and may form in much less time than is necessary to form a true polypus.

Perforation.—Perforation of the tympanic membrane without perceptible discharge.

It is doubtful whether it is wise to send anyone to the tropics who can be seen to have a perforation. Very certainly it is unwise to send anyone except the whole visible area is entirely dry and epithelialized and has apparently been so for some considerable time.

The slightest moisture of surface, whether seen only through the perforation or elsewhere, should cause unhesitating rejection.

Bulging.—Bulging, indrawing, slackness or scarring of the membrane are usually evidence of past trouble, and careful testing and examination of the nose, throat and naso-pharynx should be carried out before coming to a decision.

Candidates who have had a cortical or conservative mastoid operation (Schwartze's operation) may be passed, provided that the tympanic membrane is entire, and that the hearing power is satisfactory.

Similarly a completely *healed* perforation may be regarded as safe.

Diseases which should cause Rejection.

Deafness beyond limits named.

Occlusion of meatus by deformity, exostosis, &c.

Perichondritis.

Suppurative middle ear disease.

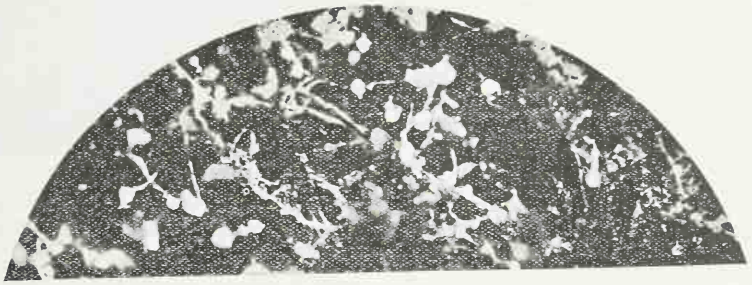
Polypus or granulations.
Evidence of radical mastoid operation.
Perforation of tympanic membrane.
Bulging, flaccidity, fixation or marked indrawing of tympanic membrane.
Tinnitus.
History of frequent earache or of vertigo.

Prospect of Treatment and of Cure in this Country.

The prospects of treatment of ear disease here are on the whole good. Wax needs no comment beyond the caution that an ear should never be syringed unless it is *seen* to be obstructed by wax, and syringing should not be persisted in without visual assurance that there is still some to come away.

Suppuration is a far more tedious matter; but a large proportion of uncomplicated cases, i.e., those in which the suppuration is limited to the tympanic cavity and to other cavities accessible therefrom, recover very rapidly under treatment by zinc ionization, the cure being more rapid, and the ultimate hearing power less impaired than when recovery takes place under other methods of treatment.

Those already complicated by infection of the antrum, mastoid, and other cells inaccessible to ionization will require careful and patient treatment, and if this does not prove successful may ultimately require a mastoid operation.



Prospects of Cure in the Tropics.

The prospects as regards cure in the tropics are, as regards most cases of ear disease, not good, especially in those localities in which the proportion of water vapour in the atmosphere is high. The two conditions I will deal with as instances are wax and middle ear suppuration.

Wax.—Wax is of itself not actively harmful, but as everyone knows, it causes deafness when it reaches the point of entirely occluding the meatus, or if it reaches inwards and makes contact with the tympanic membrane, so acting as a damper in checking its vibrations.

Deafness due to wax is liable to come on with great suddenness upon the entry of water into the ear, as in diving or bathing.

This sudden onset alarms a patient very much when it happens for the first time. Sometimes the hearing improves as the water dries out, but more often it does not improve until the removal of the wax.

Persons liable to the accumulation of wax suffer more from it in the tropics than in this country.

Middle Ear Suppuration.—These cases are both troublesome and dangerous in the tropics. As I said in the paper on "Middle Ear Disease," which I read before the Otological Section of the British Medical Association at Newcastle in July, 1921[1]:—

"One great cause of the chronicity of these cases is the occurrence of secondary infection from the outside."

These secondary infections are apt to become more complicated and more virulent in tropical countries than in temperate ones, and to be proportionately resistant to treatment and proportionately more liable to originate dangerous complications.

Apart from the causes of deafness common to all climates, and occurring in the course of diseases common to all climates, residents in the tropics are liable to deafness directly due to malaria itself. Also to cinchonism and to other diseases, e.g., Malta fever and Japanese river fever, as well as to mycoses and parasitic invasions rarely seen in temperate zones.

Closely allied to the subject of wax of which I have just spoken is that of mycosis. Several of the moulds are not uncommon inhabitants of the external meatus in this country, usually growing harmlessly as saprophytes upon the wax, but occasionally causing a chronic form of otitis externa by invading tissue. In the tropics mycotic otitis externa is far more common and sometimes causes pain or deafness.

The commonest moulds found in ears in this country belong to the genera Penicillium and Aspergillus, of which it may be broadly stated that the aspergilli usually infect tissue or, at all events, set up an otitis externa of the type of a moist eczema, while the penicillia rarely do this, growing as a rule only upon the wax, and usually on

[1] Published in the *British Medical Journal*, September 10, 1921.

hard wax in a dry ear. Not infrequently, however, such an ear is complained of as irritable, but whether this is due to associated dryness and slightly atrophic condition of the epithelial lining of the meatus or to irritation by the mould it is difficult to say. At all events, removing the wax, swabbing with alcohol, and applying dilute nitrate of mercury ointment gives marked relief.

The accompanying photograph is of a growth of penicillium on wax from a case which came to my clinic quite recently.

In the last edition of Castellani and Chalmers' book on tropical medicine, I note that ten varieties of moulds are named as affecting ears, five of them being aspergilli.

Mycosis is best treated by instilling hydrogen peroxide, syringing clear, swabbing with alcohol, or a weak solution of iodine in alcohol and insufflating boric acid powder, or applying boric acid ointment, or a weak iodine ointment, or dilute nitrate of mercury ointment.

Animal Parasites.

Many varieties of mites have been found in the ear, as have also the carnivorous larvæ of certain flies. Almost any insect small enough may find its way in as an accidental foreign body; but certain blood-thirsty species, e.g., stomoxys and cimex, appear to get there sometimes for business purposes.

The flies which deposit eggs in or about the auditory meatus are usually those which are attracted by such a putrid odour as is common in middle ear suppuration. Therefore some of the most usual genera to be represented by their larvæ are Calliphora and Lucilia.

I have recently heard of a case in America in which the larva was a "screw-worm," *Chrysomyia macellaria*.

It is best first to instil a little salad oil or alcohol, and then to syringe out.

I have also recently heard of a case in which the ear of a child was invaded by a tick which, after the manner of its kind, distended itself with blood to such an extent as to cause painful tension in the meatus.

It was dealt with by anæsthetizing the child, injecting chloroform into the meatus beyond the insect and emptying the body of the insect of blood before extracting.

Malarial Deafness.

True malarial deafness occurs almost exclusively as a result of subtertian infection; it is uncommon; in its early stages is wholly or partially amenable to treatment by quinine; but if advanced may be permanent, though sometimes intermittent, or, at all events, subject to great variations in intensity. Cases have been seen showing localized pain, tenderness, &c., and generally simulating mastoiditis.

Another type in which loss of hearing is less marked is characterized by tinnitus and very severe vertigo; it is due to labyrinthine congestion.

Malaria may also cause intermittent attacks of intense earache. This is a true otalgia and is not associated with middle ear inflammation. All these conditions are capable of being benefited, if not cured, by quinine.

I have seen many cases of suppurative disease of the middle ear, of which the origin is *said* to have been an attack of malaria; but I am profoundly sceptical as to the possibility of this disease being originated *de novo* by malarial infection.

Quinine Deafness.

Quinine causes, with varying degrees of facility in different people, both labyrinthine and tympanic congestion; it causes much tinnitus, a varying degree of deafness, and as a rule relatively little vertigo, by which last point it is distinguishable from the true malarial deafness just spoken of.

If of recent date it yields quickly to the discontinuance of quinine and the exhibition of bromides; but old tropical residents who have suffered frequently from malaria and have taken much quinine extending over long periods of time very frequently suffer from permanent and irremediable impairment of hearing.

Insolation.

Menière's disease with considerable tinnitus and vertigo may occur from exposure to sun, quite apart from either malaria or quinine. Return to a cooler climate and the use of bromide are the only remedies to be relied on.

Fevers.

It must not be forgotten that most of the acute specific fevers may be complicated or followed by aural disease. In perhaps the majority of instances this takes the form of middle ear inflammation, but even in the same disease it may also take the form of impairment of the auditory nerve, either by toxic influence or by the pressure of inflammatory exudate upon the auditory nerve in the intra-cranial part of its course.

Of diseases worth noting as of tropical or military interest, enteric, typhus, and undulant fever and cerebrospinal meningitis should be mentioned, while syphilis also causes an intractable form of nerve deafness. Espundia and yaws may cause deafness by infection of the middle ear from the destructive rhinopharyngitis which sometimes occurs in those diseases, while yaws may also cause deafness by directly affecting the auditory nerve in like manner to syphilis.

Japanese River Fever.—Deafness is often a very marked feature of the febrile attack in this disease. Hearing usually improves with convalescence; but some degree of deafness is liable to be permanent, especially in those cases which have been complicated by parotitis.

It is noteworthy that leprosy, which is so destructive to the eyes and nose, usually spares the sense of hearing.

Bathing.

In the tropics especially, a great number of cases of aural suppuration are attributed to bathing.

Indeed, an outbreak of suppurative otitis occurred in the hot weather of 1916 in a British battalion in the United Provinces of India, and affected a large number of men.

This was traced to the foul condition of a tank used for bathing, and the outbreak ceased on the use of this tank being forbidden.

It is of course well known that the entry of dirty water into the tympanic cavity, whether by way of a perforation in the tympanic membrane or by way of the Eustachian tube (which is a possibility during swimming and diving), will cause middle ear suppuration, as will also infection of the throat and post-nares with extension via the Eustachian tube; but it is possible that some of the cases of this series may have been suppurative external otitis.

In any case, this occurrence emphasizes the fact

that great care of the ears is necessary in bathing in tropical waters.

Every summer a certain number of cases of suppurative middle ear disease occurs in and near London among boys as a result of bathing, swimming and diving, some of which are undoubtedly primary. It is, however, in many cases difficult to distinguish between primary cases and those which are due to infection of the middle ear through a perforation which has been left as a result of former disease.

In the above paper mention has several times been made of syringing the ear.

This simple operation is frequently performed by most medical men. Yet, in spite of its frequency and simplicity, few will cavil at the statement that occasionally difficulty is encountered in achieving the successful removal of a foreign body in this way. This, then, must be my apology for the following hints:—

The nearer to the foreign body an unbroken stream of water can be delivered the better, especially if accurately directed to the point of contact between the foreign body and the roof of the meatus.

An inch or so of cycle valve tubing (rubber) placed on the syringe nozzle will allow a closer delivery of water without risk, as the rubber tubing can be approached almost to contact with the foreign body. The photograph shows such a piece of tubing in use.

Note also position of left hand in accompanying photograph, especially the position of the ring finger, which thus used gives great security against accidental slip or jar.

THE DETECTION AND IDENTIFICATION OF MALTOSE, GALACTOSE, SACCHAROSE AND INULIN, BY A MYCOLOGICAL METHOD.

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Maltose.

We propose to describe again a mycological method for the detection of various sugars and other carbon compounds which was theoretically devised by one of us some years ago in Ceylon, but which we have worked out experimentally only during the last few years in this country. The simplest way of carrying out the method to determine whether a substance is or is not a certain carbohydrate, is to test on the substance whenever possible the action of two germs known to be identical in all their fermentative reactions except on that particular carbohydrate. For instance, in order to see whether a given chemical substance is maltose, the substance may be tested with two organisms identical in all their biochemical reactions except their action on maltose, one fermenting it, the other not. We will make a few examples, viz., the determination of maltose, galactose, saccharose and inulin.

(*a*) A 1 per cent. sterile solution in sugar-free peptone water is made of the substance which we wish to ascertain whether it is maltose. The solution is distributed into two tubes which are labelled No. 1 and No. 2. No. 1 is inoculated with *Monilia tropicalis*, and No. 2 with *M. macedoniensis* or other monilias of the same group (*M. macedoniensoides* or *M. parachalmersi*). If after four days' incubation at 37° C. No. 1 contains gas and No. 2 does not, we can come to the conclusion that the substance is maltose. This is easily understood if we keep in mind the biochemical reactions of the two monilias. *M. tropicalis* ferments with production of gas only the following substances:—

Glucose, lævulose, maltose, galactose, saccharose.

Monilia macedonicusis ferments with production of gas only the following substances:—

Glucose, lævulose, galactose, saccharose, inulin.

The substance we are investigating has been fermented with production of gas by *M. tropicalis*. It can only be, therefore, glucose or lævulose or maltose or galactose or saccharose; but if it had been either glucose or lævulose or galactose or saccharose, it would have been gas fermented also by *M. macedoniensis*. It can only be, therefore, maltose.

Monilia tropicalis Castellani + }
Monilia macedoniensis Castellani O } = Maltose.

(*b*) No. 1 tube is inoculated with *M. metalondinensis* and No. 2 tube with *M. macedoniensis*. The two tubes are incubated at 37° C. for four days. If, after that time, No. 1 tube contains gas and No. 2 tube does not, the substance is maltose. This is explained by the fact that *M. metalondinensis* ferments with production of gas, only the following carbon compounds:—

Glucose, lævulose, maltose, galactose,

and *M. macedoniensis* only the following carbon compounds:—

Glucose, lævulose, galactose, saccharose, inulin.

The substance we are investigating has been fermented by *M. metalondinensis* It can only be, therefore, either glucose or lævulose or maltose or galactose; but if it were glucose or lævulose or galactose it would have been fermented also by *M. macedoniensis*. There is only one possibility left—it must be maltose.

Monilia metalondinensis Castellani + }
Monilia macedoniensis Castellani O } = Maltose.

(*c*) No. 1 tube is inoculated with *M. pinoyi* and No. 2 with *M. krusei*. If, after four days' incubation at 37° C., No. 1 tube contains gas and No. 2 does not, the substance is maltose. This is explained by the fact that *M. pinoyi* ferments only three carbon compounds, viz., glucose, lævulose, maltose; and *M. krusei* only two, glucose and lævulose. The substance being fermented by *M. pinoyi* must be either glucose or lævulose or maltose; but it is not fermented by *M. krusei;* it cannot, therefore be glucose or lævulose, and there remains only one possibility left—it must be maltose.

Monilia pinoyi Castellani + }
Monilia krusei Castellani O } = Maltose.

Maltosuria.—We have come across several cases of maltosuria which we propose publishing in detail in a future paper. For the detection of maltose, the urine is obtained aseptically by catheter, or if this is not feasible, is collected in a sterile receptacle and distributed at once in sterile tubes, each containing a small fermentation tube. The tubes are sterilized in Koch's stove for thirty minutes twice at an interval of six hours. This, in our experience, is generally sufficient, but at times it is advisable to repeat the sterilization in Koch's stove on two or three consecutive days. The urine should never be autoclaved, as this procedure may alter the composition of the sugars and other carbohydrates present. The urine freshly passed may also be filtered through a Chamberlain instead of being sterilized. The tubes of aseptic urine are inoculated with the monilias, as explained above. If it is suspected that maltose is present in conjunction with other fermentable substances, such as glucose, lævulose and galactose, the urine is exhausted with *M. macedoniensis*. If, after exhaustion with *M. macedoniensis* the urine is still fermentable when inoculated with *M. tropicalis* or *M. metalondinensis* or *M. pinoyi*, we can come to the conclusion that the urine contains maltose in addition to other fermentable substances. (See our paper in the *British Medical Journal*. December 29, 1917.)

Galactose.

Let us assume we want to determine whether a certain substance is galactose.

(*a*) A 1 per cent. sterile solution of the substance is made in sugar-free peptone water and distributed into two tubes (each containing a fermentation tube). No. 1 tube is inoculated with *M. metalondinensis* and No. 2 with *M. pinoyi*. If, after three days' incubation at 37° C. No. 1 tube contains gas and No. 2 does not, the substance must be galactose. The explanation lies in the fact that *M. metalondinensis* ferments only the following carbon compounds:—

Glucose, lævulose, maltose, galactose,

and *M. pinoyi* ferments only the following substances:

Glucose, lævulose, maltose.

The substance has been fermented by *M. metalondinensis*. It can only be, therefore, either glucose or lævulose or maltose or galactose. It has not, however, been fermented by *M. pinoyi*, and, therefore, it cannot be glucose or lævulose or maltose. There is only one possibility left—it must be galactose.

Monilia metalondinensis + }
Monilia pinoyi ... O } = Galactose.

(*b*) The solution is distributed into three tubes, No. 1, No. 2, No. 3, each containing a fermentation tube. No. 1 is inoculated with *M. metalondinensis*, No. 2 with *M. krusei*, No. 3 with *M. macedoniensis*. The three tubes are placed in an incubator at 37° C. for four days. If, after that period of time, No. 1 and No. 3 tubes contain gas and No. 2 does not, the substance is galactose. This is easily explained by keeping in mind the biochemical reactions of the three fungi. *M. metalondinensis* produces gas only in:—

Glucose, lævulose, maltose, galactose.

M. krusei produces gas only in:—

Glucose, lævulose.

M. macedoniensis produces gas only in:—

Glucose, lævulose, galactose, saccharose, inulin.

The substance we are investigating has been fermented with production of gas by *M. metalondinensis*. It can only be, therefore, either glucose or lævulose or maltose or galactose. It cannot be, however, glucose or lævulose, because in such a case

it would have been fermented also by *M. krusei*, and it cannot be maltose, because in such a case it would *not* have been fermented by *M. Macedoniensis*. There is only one possibility left—it must be galactose.

Monilia metalondinensis +)
Monilia krusei ... O } = Galactose.
Monilia macedoniensis +)

(*c*) No. 1 tube is inoculated with *M. tropicalis* and No. 2 tube with *M. bronchialis*. The two tubes are inoculated at 37° C. for four days. If, then, tube No. 1 contains gas, while No. 2 does not, we can come to the conclusion that the substance is galactose. This is easily understood if the biochemical reactions of the two fungi are kept in mind.

M. tropicalis gas ferments only the following carbon compounds:—

Glucose, lævulose, maltose, galactose, saccharose.

M. bronchialis gas ferments the following carbohydrates:—

Glucose, lævulose, maltose, saccharose.

The substance we are investigating has been fermented by *M. tropicalis;* therefore, it can only be one of the following carbohydrates: glucose or lævulose or maltose or galactose or saccharose; but if it were glucose or lævulose or maltose or saccharose it would have been fermented also by *M. bronchialis*. There is only one possibility left—it must be galactose.

Monilia tropicalis Castellani +)
Monilia bronchialis Castellani O } = Galactose.

(*d*) The solution is distributed into three tubes. No. 1 is inoculated with *M. macedonicnsis*, No. 2 with *M. krusei*, and No. 3 with *B. paratyphosus* B, Schottmuller. If, after four days in the incubator at 37° C. No. 1 tube shows presence of gas, No. 2 tube shows absence of gas, and No. 3 shows presence of gas, we can come to the conclusion that the substance we are investigating is galactose. Why? As the substance has been gas-fermented by *M. macedonicnsis* it can only be:—

Glucose, lævulose, galactose, saccharose, or inulin; but it has not been fermented by *M. krusei*, therefore it cannot be glucose or lævulose; it can only be galactose, saccharose, or inulin; but if it were saccharose or inulin, it would not have been fermentable by *B. paratyphoid* B. There is only one possibility left—it must be galactose.

Monilia macedoniensis Castellani ... +)
Monilia krusei Castellani ... ... O } = Galactose.
Bacillus paratyphosus B. Schottmuller +)

Galactosuria.—The detection of galactose in urine is carried out, using the same method. The urine is collected aseptically and distributed into sterile tubes, each containing a Durham's fermentation tube. These tubes of urine are sterilized in Koch's stove for thirty minutes once or twice as described in the case of maltosuria. The urine should never be autoclaved as such a procedure often alters the chemical composition of the sugars present.

The tubes are inoculated with the monilias as described above. If it is suspected that galactose is present in addition to other fermentative substances, such as glucose and lævulose, the urine should be exhausted with *M. pinoyi*. If, after exhaustion with *M. pinoyi* the urine is still fermentable by *M. metalondinensis*, the conclusion is that the urine must have contained galactose in addition to either glucose or lævulose, or both glucose and lævulose. Of course, strains of *M. pinoyi* and *M. metalondinensis* should be used having the same degree of fermentative power on the sugars they both ferment.

Saccharose.

A 1 per cent. sterile solution of the substance suspected to be saccharose is made in sugar-free peptone water, and some of the solution is placed in two tubes, No. 1 and No. 2. No. 1 is inoculated with *M. tropicalis* and No. 2 with *M. metalondinensis*. If, after four days' incubation, No. 1 tube contains gas and No. 2 does not, we can come to the conclusion that the substance was saccharose.

(*a*) This is easily understood if the following facts are kept in mind. *M. tropicalis* gas ferments only the following five carbon compounds:—

Glucose, lævulose, maltose, galactose, saccharose.

M. metalondinensis only the following four carbon compounds:—

Glucose, lævulose, maltose, galactose.

If the substance is fermented by *M. tropicalis*, there are five possibilities: it may be glucose or lævulose or maltose or galactose or saccharose; but if the same substance is not fermented by *M. metalondinensis* it cannot be glucose or lævulose or maltose or galactose, and must, therefore, be saccharose.

Monilia tropicalis ... +)
Monilia metalondinensis O } = Saccharose.

(*b*) No. 1 tube is inoculated with *M. rhoi* and No. 2 with *M. pinoyi*. If, after four days' incubation at 37° C. No. 1 contains gas and No. 2 tube does not contain gas, the substance is saccharose. The explanation lies in the fact that *M. rhoi* ferments, with production of gas, glucose, lævulose, maltose, saccharose, and *M. pinoyi* gas ferments glucose, lævulose, maltose.

If the substance is fermented with production of gas by *M. rhoi*, it must be either glucose or lævulose or maltose or saccharose, but if it were glucose or lævulose or maltose it would have also been gas-fermented by *M. pinoyi;* it must, therefore, be saccharose.

Monilia rhoi +)
Monilia pinoyi O } = Saccharose.

(*c*) No. 1 tube is inoculated with *M. tropicalis*, No. 2 with *B. paratyphosus* B, or any strain of *B. coli communis, sensu stricto* (does not ferment saccharose). If, after four days in the incubator at 37° C., No. 1 tube contains gas and No. 2 tube does not, we can come to the conclusion that the substance we are investigating is saccharose. This

is easily understood, keeping in mind the following facts: The substance has been fermented by *M. tropicalis;* it can only be therefore:—

Glucose, lævulose, maltose, galactose, saccharose.

But if it were glucose or lævulose or maltose or galactose, it would have gas-fermented also by *B. paratyphosus* B, and by any strain of the *B. coli communior* group. There is only one possibility left—it must be saccharose.

Monilia tropicalis +)
B. paratyphosus B. O) = Saccharose.

(*d*) The solution is distributed into three tubes. No. 1 tube is inoculated with *M. macedoniensis*, No. 2 with *B. paratyphosus* B, or a strain of *B. coli communis*, and No. 3 with *B. asiaticus* or any strain of *B. coli communior*, such as *B. pseudo-coli* and *B. neapolitanus*. The three tubes are kept at 37° C. for four days, and the results are then read. If No. 1 tube and No. 3 tube contain gas and No. 2 tube does not contain gas the substance must be saccharose. The carbon compound we are investigating has been gas-fermented by *M. macedoniensis;* it can only be therefore one of the following carbon compounds:—

Glucose, lævulose, galactose, saccharose, inulin.

As it has not been gas-fermented by *B. paratyphosus* B or strains of *B. coli communis* it cannot be glucose, lævulose, or galactose. There are only two possibilities left: the substance is either saccharose or inulin; but if it were inulin it would not have been gas-fermented by *B. asiaticus* or strains of *B. coli communior;* therefore the substance must be saccharose.

Monilia macedoniensis +)
B. paratyphosus B. ... O) = Saccharose.
B. asiaticus ... ... +)

Monilia macedoniensis +)
B. coli communis ... O) = Saccharose.
(*sensu stricto*)
B. coli communior ... +)

Monilia macedoniensis +)
B. paratyphosus B. ... O) = Saccharose.
B. coli communior ... +)

Inulin.

Inulin, as is well known, is a polysaccharide—closely related to starch—present in a large amount in artichokes, bulbs of dahlias, and dandelions and chicory roots. It was first isolated from the roots of *Inula helenium* (elecampane root), hence its name inulin. From dahlia roots, in which it is present in more than 10 per cent., inulin can be easily extracted by boiling with water, which on cooling will deposit the inulin in the form of numerous minute spherules. The principal chemical characteristics of inulin are the following: It is a white powder of a sphæro-crystalline appearance, with no taste; it swells and then dissolves in hot water, giving a clear solution. It is insoluble in alcohol; is stained brownish by iodine; is not reduced by Fehling's solution; is lævo-rotatory; and when boiled with diluted sulphuric acid yields lævulose.

As already stated, inulin is a polysaccharide, somewhat related to starch, from which it differs, however, in the following very important characteristics:—

(1) The blue iodine reaction is negative with inulin.

(2) Inulin is changed into lævulose by diastase, while starch is converted into maltose and dextrin.

(3) When treated with sulphuric acid inulin yields lævulose, while starch yields dextrin.

Mycological Identification.

It is generally stated that there is no fungus which induces a complete fermentation of inulin—that is to say, fermentation with production of gas; but one of us (C.) has found a monilia which causes complete fermentation of this carbohydrate with large production of gas. This organism, *M. macedoniensis* Cast., and allied species, ferments with production of gas in addition to inulin the following carbohydrates: Glucose, lævulose, galactose and saccharose.

By means of this fungus in conjunction with certain other fungi it is possible to identify inulin, using a modification of the general mycological method we described some time ago for the determination of various sugars. (See *British Medical Journal*, December 29, 1917, and February 15, 1919.)

Let us suppose we have a substance which we want to determine whether it is inulin or not. A sterile 1 per cent. solution is made in sterile sugar-free peptone water and distributed into two tubes, No. 1 and No. 2, each containing a Durham's fermentation tube or similar appliance. The following procedure may then be carried out:—

(*a*) No. 1 tube is inoculated with *M. macedoniensis* Cast., No. 2 tube with *M. tropicalis* Cast. If, after four days in an incubator at 37° C., No. 1 tube contains gas and No. 2 tube contains no gas, we can come to the conclusion that the substance was inulin. This is easily understood by keeping in mind the fermentative reactions of the two monilias. As already stated, *M. macedoniensis* ferments with production of gas only the following carbon compounds:—

Glucose, lævulose, galactose, saccharose, inulin.

M. tropicalis Cast. ferments with production of gas only the following carbon compounds:—

Glucose, lævulose, maltose, galactose, saccharose.

As the substance we are investigating has been fermented by *M. macedoniensis* Cast., it must be either glucose, lævulose, galactose, saccharose, or inulin; but as it has not been fermented by *M. tropicalis* Cast., it cannot be glucose or lævulose or galactose or saccharose, and therefore it must be inulin.

The above procedure may be represented by the following formula:—

Monilia macedoniensis Cast. +)
Monilia tropicalis Cast. ... O) = Inulin.

(*b*) No. 1 tube is inoculated with *M. macedoniensis*, No. 2 tube with *M. rhoi.* The two tubes

are placed in an incubator at 35-37° C. for four days. If after that time No. 1 tube contains gas and No. 2 tube does not contain gas, we can come to the conclusion that the substance in all probability is inulin. This is easily understood by keeping in mind the fermentative reactions of *M. macedoniensis* and *M. rhoi.*

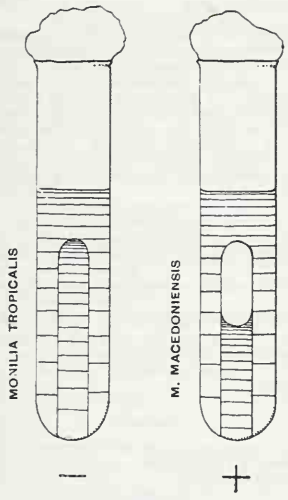
M. macedoniensis ferments with production of gas only the following carbon compounds:—

Glucose, lævulose, galactose, saccharose, inulin.

M. rhoi ferments with production of gas only the following carbon compounds:—

Glucose, lævulose, galactose, saccharose.

The substance we have investigated was fermented by *M. macedoniensis;* therefore, it can only be either glucose, lævulose, galactose, saccharose, *or* inulin; but it has not been fermented by *M. rhoi,* therefore it cannot be glucose or lævulose or



Identification of Inulin.

galactose or saccharose; there is only one possibility left—it must be inulin.

Monilia macedoniensis Cast. + }
Monilia rhoi Cast. ... ... O } = Inulin.

(*c*) No. 1 tube is inoculated with *M. macedoniensis;* No. 2 tube with *B. pseudo-coli* or *B. neapolitanus,* or any other strain of the communior group of *B. coli* (gas ferments saccharose) or *B. asiaticus.* The tubes are inoculated at 37° C. for four days. If then tube No. 1 (*M. macedoniensis*) contains gas and tube No. 2 does not contain gas, we can come to the conclusion that the substance was inulin. Why? It is sufficient to remember that *M. macedoniensis* gas ferments only the following carbon compounds:—

Glucose, lævulose, galactose, saccharose, inulin.

The substance we are investigating has been gas-

	Glucose	Lævulose	Maltose	Galactose	Saccharose	Lactose	Mannite	Dulcite	Dextrin	Raffinose	Arabinose	Adonite	Inulin	Sorbite	Starch	Glycerine	Inosite	Salicine	Amygdalin	Isodulcite	Erythrite
Monilia balcanica Castellani	G	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
M. krusei Castellani	G	G	G	G	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
M. pinoyi Castellani	G	G	G	G	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
M. metalondinensis Castellani	G	G	G	G	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
M. tropicalis Castellani	G	G	G	G	G	G	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
M. rhoi Castellani	G	G	O	O	G	G	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
M. macedoniensis Castellani	G	G	O	G	G	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Bacillus coli Escherich (*coli communis type*)	G	G	G	G	O	G	G	G	G	G	G	O	O	G	G	G	G	G	G	G	G
B. pseudo-coli Castellani (*coli communior type*)	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
B. paratyphosus B, var. A. Schottmuller	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
B. paratyphosus A. Schottmuller	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
B. asiaticus Castellani	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
B. pseudo-asiaticus Castellani	G	G	G	G	G	O	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

G = gas ; O = absence of gas.

fermented by that fungus; it can therefore only be glucose, lævulose, galactose, saccharose, or inulin; but if it had been glucose or lævulose or galactose or saccharose it would have been fermented also by *B. pseudo-coli* or *B. neapolitanus* or any other strain of the *Coli communior* group[1], or by *B. asiaticus* (see table, p. 45); it must therefore be inulin

Monilia macedoniensis Cast. + *B. coli communior* (*B. pseudo-coli* Cast., *B. neapolitanus* Emmerich ... ... O	=	Inulin
Monilia macedoniensis Cast. + *B. asiaticus* Cast. ... ... O	=	Inulin.

Addendum.

For the reader's convenience we annex a table (p. 45) containing the fermentative characters of the various fungi and bacteria we use in our method, and we give also a list of the principal mycological formulæ which we have devised and employed in the identification of various sugars and other carbon compounds. It is essential to use strains with permanent biochemical reactions. Acid fermentation without production of gas is not taken into account

MYCOLOGICAL FORMULÆ.

Inulin.

Monilia macedoniensis Cast. ... ... + *M. tropicalis* Cast. ... ... O	=	Inulin.
M. macedoniensis Cast. ... ... + *M. rhoi* Cast. .. .. O	=	Inulin.
M. macedoniensis Cast. ... ... + *Bacillus coli-communior* (*B. pseudo coli*, *B. neapolitanus*) ... ... O	=	Inulin.
M. macedoniensis Cast. ... ... + *B. asiaticus* Cast. ... ... O	=	Inulin.

Maltose.

M. tropicalis Cast. ... ... + *M. macedoniensis* Cast. ... ... O	=	Maltose
M. metalondinensis Cast. ... ... + *M. macedoniensis* Cast. ... ... O	=	Maltose.
M. pinoyi Cast. ... ... + *M. kreusi* Cast. ... ... O	=	Maltose.
M. pinoyi Cast. ... ... + *M. macedoniensis* Cast. ... ... O	=	Maltose.

Galactose.

M. metalondinensis Cast. ... ... + *M. pinoyi* Cast. .. .. O	=	Galactose.
M. metalondinensis Cast. ... ... + *M. krusei* Cast. ... ... O *M. macedoniensis* Cast. ... ... +	=	Galactose.
M. tropicalis Cast. ... ... + *M. bronchialis* Cast. ... ... O	=	Galactose.
M. tropicalis Cast. ... ... + *M. macedoniensis* Cast. ... ... + *M. krusei* Cast. ... ... O *B. paratyphosus* B. Schottmuller ... +	=	Galactose.

Saccharose.

M. tropicalis Cast. ... ... + *M. metalondinensis* Cast. ... ... O	=	Saccharose.
M. rhoi Cast. ... ... + *M. pinoyi* Cast ... ... O	=	Saccharose.
M. tropicalis Cast. ... ... + *B. coli communis* (*sensu stricto*) ... ... O	=	Saccharose.
M. tropicalis Cast. ... ... + *B. paratyphosus* B. Schottmuller ... O	=	Saccharose.
M. macedoniensis Cast. ... ... + *B. paratyphosus* B. Schottmuller ... O *B. asiaticus* Cast. ... ... +	=	Saccharose.
M. macedoniensis Cast. ... ... + *B. coli communis* (*sensu stricto*) ... ... O *B. coli communior* ... ... +	=	Saccharose.
M. macedoniensis Cast. ... . + *B. paratyphosus* B. Schottmuller ... O *B. coli communior* ... ... +	=	Saccharose.
B. coli communis Escherich (*sensu stricto*) O *B. neapolitanus* Emmerich ... ... +	=	Saccharose.
B. coli communis Escherich (*sensu stricto*) O *B. asiaticus* Cast. ... ... +	=	Saccharose.

Lævulose.

M. krusei Cast. ... ... + *M. pinoyi* Cast. ... ... O	=	Lævulose.

Glucose.

M. balcanica Cast. .. .. + *M. krusei* Cast. ... ... O	=	Glucose.

Inosite.

B. paratyphosus B. var. M. Schottmuller + *B. paratyphosus* A. Schottmuller... ... O	=	Inosite.

CHEMICO-MYCOLOGICAL FORMULÆ.

Saccharose.

Fehling ... ... O *M. tropicalis* Cast. ... ... +	=	Saccharose.

Lactose

Fehling ... ... + *B. paratyphosus* B. Schottmuller ... O *B. coli communis* Escherich ... ... +	=	Lactose.

Pentose.

Fehling ... ... + *M. tropicalis* Cast. ... . O *B. paratyphosus* B. Schottmuller ... + *B. coli communis* Escherich ... ... +	=	pentose (generally arabinose.)

\+ = gas; O = no gas.

[1] Bacteria of the coli group are generally divided into two subgroups; those fermenting saccharose (*Coli communior*) and those non fermenting this sugar (*Coli communis*). *B. pseudo-coli* and *B. neapolitanus* belong to the first group, while Escherich's original *B. coli* and *B. colotropicalis* belong to the second group.

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THE JOURNAL OF

Tropical Medicine and Hygiene

FEBRUARY 15, 1922.

SIR RONALD ROSS ON THE NEED FOR AN IMPERIAL BUREAU.

IN *The Times* lately Sir Ronald Ross has with zeal and enthusiasm, as is characteristic of him, raised the question of advancing the study of malaria. He does not think that sufficient is being done to lessen the amount of malaria in the world, and with this all tropical practitioners will agree. He believes, and no one has a better right to speak, that the cause can be best advanced by the formation of an Imperial Bureau for Malaria, with functions, aims, and objects which he so tersely and definitely sets forth. He points out that the literature is so enormous that no man has, or perhaps can ever, in a lifetime gather the items that constitute its history and the varied consequences of its presence in the world. One department of the subject—namely, its mosquito-malarial bearings—he has been the chief agent in tracing to its foundation, but that does not satisfy what Sir Ronald Ross contemplates should be done. The practical issue of that great discovery has been meagre in his judgment, and with that all agree. We may well ask is the disease malaria going to defy man, equipped as he is to-day with men endowed with trained scientific minds and laboratories fitted for investigation powers as they have never been before?

Sir Ronald Ross asks for the establishment of an Imperial Bureau; we do not think he is asking enough. We would suggest that the field of study should be much wider, and for the benefit of the Empire and the honour of the country Britain of all civilized nations has the greatest responsibility in connection with tropical ailments, the matter should be more fully organized to meet its acknowledged duties to mankind. It should be, and must be, dealt with on an Imperial scale if Britain is to fulfil her responsibilities, and we hope and believe that Sir Ronald Ross, by his advocacy of Imperial endeavour, will succeed in bringing about a centre of information, knowledge and organization which will focus our requirements and be able to meet our wants.

We herewith append Sir Ronald Ross's latest letter on this subject to *The Times* of January 2, 1922:—

"WAR ON MALARIA.—NEED FOR IMPERIAL BUREAU.

"Sir Ronald Ross's Scheme.

To the Editor of *The Times.*

"SIR,—In the story of malaria which I gave to your Special Correspondent and which you published so handsomely in *The Times* of December 29, I concluded by stating that this country ought to have a malaria bureau for the Empire. I have been asked to explain what I mean, and trust that you will allow me a little space to do so with brevity.

"As I said, malaria has now been studied for 2,000 years. The literature on the subject is therefore simply enormous, and is written in almost every civilized language, ancient and modern. I do not suppose that any living person has read more than half of it, much less analysed and collated what he has read. The subject is divided into seven main headings—namely, history, parasites, illness, treatment, mosquitoes, epidemiology, and prevention. I suppose that there are at least a hundred minor points of importance or interest under each main heading; and these points have often been discussed in the literature referred to.

Much of this literature has been forgotten, though really important—as was the case with the article of 1883 by A. F. A. King on mosquitoes and malaria; and still more of it is being poured forth daily and is overlooked even by specialists. How, I ask, can this country expect any private doctor to remain cognizant of such a flood of work?

"The result is that innumerable investigations are made upon points already investigated or upon blind issues, wasting endless time, trouble, and money. Still worse, when the emergency occurs no one can give final answers. For example, during the war and after I was asked three questions—what is the amount of malaria in the Dardanelles? what is the best way to cure malaria completely? and how can it be diagnosed between relapses? Neither I nor anyone else was able to reply definitely to any one of them, with the result that the country was forced to spend untold millions of pounds in connection with the malaria in Salonika, Mesopotamia, and East Africa. I was not able to reply for two reasons—many points had never been investigated, and regarding others which had been investigated the results of those investigations were not then known. Many points still remain unknown to us; but worse than that, no one really knows what is known to us! The proposed Imperial Malaria Bureau would be designed to remove the latter defect in our scientific organization. We possess an army which is constantly carrying out a desultory war against King Malaria, but that potentate holds his position with ease beeause our army possesses no intelligence department. The Malaria Bureau should be the Intelligence Department of this army.

"What is the least thing required then? An office with two or three rooms containing a complete library on malaria and some cognate subjects; one typist, one polyglot clerk, and the best man we can find as director. The work will consist (1) in compiling a cross index so that all the literature bearing on any given point can be looked up at once; and (2) in adjudging the value of all the contributions to our knowledge on that point. The first can be done by the clerk after a little instruction; the latter must be done by the director himself, and he must indeed be a man possessed of that rare thing, a sound scientific judgment. By degrees, of course, abstracts will be prepared of all the literature bearing on the point, together with the considered judgment of the director. When any person wishes to undertake investigations or governments or commercial companies ask for information, help, or guidance, the abstract will be sent to them, and it ought to be the very best information and judgment procurable.

"Of course, there are local as well as general facts about malaria which will have to be recorded in this office; and if results are to be quickly expected, probably more than one clerk, and an assistant to the director, will be required.

"The disease causes such an immense expense to the Empire that some such organization as this is obviously necessary, and one hopes funds will some day be forthcoming. Perhaps £1,500 a year would be sufficient to begin with. Possibly a whole-time director would not be required; but he will have to be a man of great enthusiasm for the cause; and here precisely the old danger will come in—namely, that men who have really never added a jot to our knowledge of the subject may manage to take control of the whole machine, and the greatest care will have to be taken that this does not happen. Similar bureaus are obviously required for other diseases besides malaria, of which the literature now far exceeds the capacity of any one private individual to digest and assimilate.

"We now have two schools and two bureaus of tropical medicine in general, besides an entomological bureau, and it will be asked whether these do not suffice. My answer is, No. They are engaged upon a very wide subject, of which malaria is only one part. The *Tropical Disease Bulletin* already does much of the work, but cannot, naturally, perform all that I think the proposed bureau should do. This is my scheme in the rough, but I dare not take up more of your space by entering into further details regarding it.

"Yours faithfully,

"RONALD ROSS.

"36, Harley House, Regent's Park,
London, N.W.1., *Dec.* 30, 1921."

Annotations.

Observations on Malaria at Kisaran in the Holland-America Plantation Company (N. C. Keukensehrijver, *Geneesk. Tijdschr. v. Nederl.-Indie*, vol. lxi, No. 2, 1921).—The author gives particulars of a malaria epidemic which occurred at Kisaran. Ten different species of anopheles were found, of which *Anopheles kochii* was considered the principal carrier. Large quantities of quinine were distributed on the estates, with the result that malarial parasites were found in the blood of patients without any enlargement of the spleen. Valuable measures were carried out in the way of improved feeding, oiling, drainage, mosquito netting, &c., but the importation of new coolies had a very bad effect on the spread of the epidemic.

Typhoid Fever in Infants (W. Larsson, *Monatsschrift für Kinderheilkunde*, Berlin, July, 1921).—The author is of the opinion that the prognosis of typhoid in infants is more favourable than in older children and adults. It must be differentiated from paratyphoid, dysentery and various forms of meningitis and alimentary toxicosis. Treatment consists of tepid baths and application of ordinary rules of infant feeding, the ingestion of liquids being of especial importance in cases where the water balance has been reduced.

Original Communications.

OF THE NATURE OF THE ANTIGEN IN THE COMPLEMENT-FIXATION TEST FOR BILHARZIOSIS.

By Geraldine Z. L. LeBas, B.Sc.(Lond.), F.C.S.

University College Hospital Medical School, London.

(In conjunction with a Mission to Egypt from the London School of Tropical Medicine.)

The application of the Bordet-Gengou Complement-fixation test to the investigation of Helminthic infections during the last fifteen years has produced a number of results. In some cases they are not concordant and also appear discordant with the majority of the results obtained by this reaction in other immunity problems, notably those of bacterial infection and of antibodies produced against tissue extracts. The antigens employed, from the point of view of their mode of preparation, fall into two classes: those obtained by the extraction of the material with physiological saline, and those obtained by extraction with alcohol or, rarely, ether.

(The term "Antigen" will be employed in this paper to cover the term "Receptor," which has fallen into disuse owing to its association with the mechanical concepts of the Ehrlich side-chain theory. It must not be taken to imply that the so-called Antigen is necessarily capable of stimulating the production of specific antibodies by injection into an animal; but that in the presence of certain sera complement fixation can be obtained.)

Antigens extracted with physiological saline—to be referred to in this paper as saline antigens—have been found to yield positive results of a varying degree of specificity for individual helminthic infections. Ghedini (1907) tried sera from cases of infection with *Ancylostomum duodenale* against antigens prepared from *A. duodenale*, *Trichocephalus dispar* and against hydatid fluid: and also sera from cases of infection with *Ascaris lumbricoides* against an antigen from *A. lumbricoides* and against hydatid fluid. He obtained complement fixation when he employed the homologous antigen and negative results with the other antigens. Weinberg and Parvu (1908), investigating helminthic infections of the horse (*Sclerostoma*, *Ascaris*, *Tænia perfoliata* and *T. plicata*), and employing saline antigens prepared either from fresh material or from parasites dried in alcohol, found that they generally obtained consistent results with sera from heavily infected horses, but that the fixation was not quite specific. Weinberg (1909) obtained good results in a large number of experiments with saline solutions of desiccated hydatid fluid from cysts in man or sheep, the sera being obtained from cases of echinococcus infection in man. Kolmer, Trist and Heist (1916), carrying out complement fixation tests with the sera of dogs infected with *Tænia serrata*, *Dipylidium caninum*, *Ascaris canis* and *Trichocephalus dispar*, considered that their results showed some degree of specificity with the saline antigens; although the dogs' sera frequently yielded positive results with antigens prepared from parasites "the ova of which could not be found in the fæces" (this may be attributable to the previous and unknown infections of the dogs employed in the experiments). But they found that if rabbits were inoculated with their saline antigens, specific complement fixation could be obtained with their sera. Fairley (1919) obtained good and consistent results employing saline antigens prepared from the livers of snails—*Planorbis boissyi* infected with *Schistosomum mansoni* and *Bullinus dybowski* infected with *S. hæmatobium*. The sera of patients having Bilharziosis due to either specie reacted equally well with antigens from either species of snail. He found, however, that he obtained more satisfactory results with an alcoholic extract.

The results recorded with alcoholic antigen extracts of helminth material vary greatly; both in regard to their specificity for individual helminthic infections, and in regard to their capability for serving as antigens in the Wassermann reaction for Syphilis. As in the results recorded by Kolmer, Trist and Heist (1916) (see above) a marked difference in specificity is noticeable between results obtained from injections of parasite tissue, and results obtained by infection. Meyer (1904) found that the serum of a rabbit inoculated with tapeworm fixed complement in the presence of either crude or purified alcoholic extract of tapeworm. These results were confirmed by Thiele and Embleton (1913). These observers found that the serum from a rabbit inoculated with killed *Tænia crassicollis* gave complement fixation with both the "free" and the "bound" "Lecithin" (Erlandsen's classification), extracted from homologous tapeworms. On the other hand Violle and Le Saint-Rat (1920) state that an extract of tapeworm prepared by Noguchi's method gave no fixation with the sera of patients *infected* with tapeworm. Further, these authors found that whilst their extract was negative with normal serum, complement was fixed in the presence of syphilitic serum; whereas both Meyer (1904) and Thiele and Embleton (1913) obtained negative results with the sera from cases of syphilis. Jianu (1909) obtained positive results with cases of echinococcus infection by employing an antigen prepared from desiccated hydatid fluid, the extraction being carried out with ether, according to the method used by Lesser (1909) in preparing a Wassermann antigen from normal heart tissue. Israel (1910) prepared alcoholic antigens from hydatid fluid and from the cyst wall; using five times the bulk of alcobol to that of material for extraction. He found that syphilitic sera were capable of fixing complement in the presence of these antigens, but he considers that a specific substance capable of reacting with sera from echinococcic infections is also present in the antigens prepared from cyst fluid, but not from the cyst wall; this is borne out by the fact that these latter sera will fix complement with his antigens but not with lipoidal extracts from other sources, which are capable of acting in the Wassermann reaction. Brauer (1911) obtained similar results with alcoholic antigens prepared from hydatid fluid. Usami (1919) found that an alcoholic extract of hookworm gave

positive results with cases of hookworm, and negative results with normal and syphilitic sera. Details of his mode of preparation of this extract are not available in either the English or the American abstract.

Regarding the relative value of saline and alcoholic antigens, Kolmer, Trist and Hirst (1916) considered that they obtained more specific results with their alcoholic extracts than with their saline antigens (results described above). Fairley (1919), as is stated above, found that the alcoholic antigen was more stable and more sensitive. He obtained (*a*) in cases of infection of less than two years' standing with the saline antigen 72 per cent., and with the alcoholic 88·8 per cent. of positives, (*b*) in cases of over two years' standing with the saline antigen 67·4 per cent., and with the alcoholic antigen 74·2 per cent. of positives. In no case did he obtain a positive reaction with cases infected with syphilis but free from bilharzia.

The fact that alcoholic extracts seem efficacious antigens in helminthic infection is in contrast with that of most bacterial infections. Tubercle bacilli and possibly *B. lepræ* seem exceptional; for Camus and Pagniez in 1901 found that sera of tuberculous patients would fix complement with tuberculin. But Bordet (1920) remarks on this, that it is to be noted that the substance employed was crude tuberculin containing debris of the bacilli, and he says that Calmette and Massol found the active principle termed "tuberculin" inactive as an antigen. Thiele and Embleton (1915) found, however, (1) That the sera of rabbits inoculated with whole *B. tuberculosis* reacted equally well with antigens prepared from (*a*) whole bacilli, (*b*) bacilli with fats and lipoids removed, (*c*) with phosphatids obtained from the bacilli, (*d*) with Nastin. (2) That rabbits inoculated with antigen (*c*) reacted well with whole and extracted bacilli, and vigorously with antigen (*c*). With these exceptions the Bordet-Gengou reaction has been found to be applicable only to saline extracts, or saline suspensions of bacteria or infected organs. In the case of tissue extracts there has been some divergence of opinion, but in general it is found that saline extracts are efficacious and purified alcoholic extracts are not. An exception must be made in the case of the alcoholic extracts of organs which exhibit heterophilic antigenic properties (Taniguchi (1921) Forssmann and many others). It was on this account and because Fairley (1919) obtained better results with alcoholic extracts, that it was considered of interest to examine more closely the behaviour of alcoholic extracts of infected snails with Bilharziosis serum.

In the preparation of the alcoholic extract Fairley (1919) used 1 c.c. of absolute alcohol for the extraction of each snail's liver. Now this entailed considerable dilution of the alcohol employed; both by reason of the water content of the snail's liver and by reason of the amount of water which invariably surrounds the liver in the dissection. The result will be that the alcoholic extract will be liable to contain a considerable amount of protein, which may account for its antigenic properties. On this account an antigen (Antigen II) has been prepared by extraction of *dried* snails' livers with absolute alcohol in order to obtain an antigen as far as possible free from protein. The next step has been the preparation of an antigen (Antigen III) by the extraction of the residue left from the absolute alcohol extraction, with diluted alcohol; thus giving an antigen, corresponding to Fairley's alcoholic antigen, with the fats, lipoids cholesterin and other allied substances so far as possible removed.

Experimental.

Technique of Complement-Fixation Test.

Complement:—1½ units are employed, that is 30 c.mm. of normal guinea-pig serum. The standardization of the complement being carried out by the method advised by Thiele and Embleton (1914 (2)) for the simultaneous standardization for the amhoceptor and complement.

Hæmolytic System.—Washed normal sheep red cells 10 per cent. in normal saline, and an equal quantity of standardized solution of amboceptor (Burroughs Wellcome & Co.).

Hæmolytic Control for the Antigen is put up with ordinary sheep red cells 10 per cent. and no amboceptor; and is placed in the rack at the beginning of the experiment and left the whole time.

Test.—The antigen anticomplementary titre, and the serum tests are set up with the complement; and the fixation was carried out for half-an-hour at room temperature and for half-an-hour at 37° in a Wassermann hath. Red cells and amboceptor are then added, and the rack of tubes replaced in the hath for another half-hour; after which the reading is taken. In all doubtful cases the tubes were centrifuged. All sera were inactivated, by heating to 56°C. for a quarter-of-an-hour before use in order to destroy any natural complement, and to remove any thermolabile anti-complementary tendency which they may have possessed. The known normal and syphilitic sera were all pooled sera; which had been tested the same day in the laboratory with the Wassermann reactions: using both Noguchi and Cholesterin antigens. All sera employed were those which had proved either fully negative or fully positive.

The serum from a patient, H—d, was tested by the Wassermann reaction with both antigens and was found completely negative.

The Bilharziosis serum was tested each time with the saline antigen, prepared, according to Fairley (1919), by extracting the livers of *P. boissyi* infected with *S. mansoni*. Two snails' livers were shaken vigorously for half-an-hour with 2 c.c. physiological saline, and the mixture was then incubated at 37°C for 24 hours; it was then filtered and the filtrate was used as the antigen. (Table I.)

II.—Antigen II extracted with Absolute Alcohol.

Preparation:—About thirty livers of snails infected with *S. mansoni* were placed in dry acetone, immediately after their dissection and diagnosis; the

TABLE I.—SALINE ANTIGEN I. PREPARED ACCORDING TO FAIRLEY (1919).

1 (*a*) Tests performed on 21st January 1 (*b*) Tests performed on 11th February.

Nature of Test— 1 (*a*)	Sera 100 c.mm.	Antigen in c.mm.	Complement in Units	Normal Saline in cc.	Sheep Red Cells. 10 % in c.mm.	Amboceptor in c.mm.	Result
Antigen Anticomplementary	...	300	1½	1	100	100	— — — —
,, ,,	...	400	1½	1	100	100	— — — —
Antigen Hæmolytic	...	200	...	1	100	...	+ + + +
H—d for Bilharzia	H—d	100	1½	1	100	100	+ + + +
H—d Anticomplementary Control ...	,,	...	1½	1	100	100	— — — —
Pooled Serum for Normal Control ...	Pooled serum	100	1½	1	100	100	— — — —
Pooled Serum Anticomplementary ...	,, ,,	...	1½	1	100	100	— — — —
Nature of Test—1 (*b*).							
Antigen Anticomplementary	...	300	1½	1	100	100	— — — —
Antigen Hæmolytic	...	200	...	1	100	100	+ + + +
H—d for Bilharzia	H—d	100	1½	1	100	100	+ + + +
H—d Anticomplementary	,,	...	1½	1	100	100	— — — —
Pooled Serum for Normal Control ...	Pooled Normal	100	1½	1	100	100	— — — —
Pooled Serum Anticomplementary ...	,, ,,	...	1½	1	100	100	— — — —
Syphilitic Serum for Control	PooledSyphilitic	100	1½	1	100	100	— — — —
Syphilitic Serum Anticomplementary	,, ,,	...	1½	1	100	100	— — — —

Saline Antigen prepared according to Fairley (1919) is effective in that (1) it gives negative results both with known normal and known syphilitic sera: (2) it gives positive results with a suspected case of Bilharzia.

The serum of the case submitted (H—d) showed a fully positive reaction on both occasions. This man was in S. Africa in 1902; and contracted vesical Bilharziosis due to infection with S. hæmotobium. Since this date he has not been exposed to re-infection. Although under observation no ova have been found in the urine during the past year, and no ova could be found even after a provocative treatment with 2 gr. of sodium antimonyl tartrate given between the dates of the taking of the blood for the two complement-fixation tests. A differential leucocyte count made on 6th February gave the following result:

Polymorphs	48 per cent.	+ + + + =	complete inhibition of hæmolysis.
Lymphocytes	36 ,,	− + + + =	almost complete ,, ,, ,,
Large Mononuclear	4 ,,	− − + + =	partial ,, ,, ,,
Eosinophiles	12 ,,	− − − + =	slight ,, ,, ,,
Basophiles	— (500 counted)	− − − ± =	trace of ,, ,, ,,
		− − − − =	complete hæmolysis.

TABLE II —ANTIGEN EXTRACTED WITH ABSOLUTE ALCOHOL FROM LIVERS OF SNAILS INFECTED WITH BILHARZIA (21.1.22.)

Nature of Test.	Sera 100 c.mm.	Antigen in c.mm.	Complement in units.	Normal Saline in c.c.	Sheep Red Cells. 10% in c.mm.	Amboceptor in c mm.	Result.
Antigen Anticomplementary	...	100 v	1½	1	100	100	— — — —
,, ,, ...	...	200	1½	1	100	100	— — — —
,, ,, ...	...	300	1½	1	100	100	— — — —
,, ,, ...	...	400	1½	1	100	100	— — — —
,, ,, ...	...	500	1½	1	100	100	— — — —
,, ,, ...	...	600	1½	1	100	100	— — — —
Antigen Hæmolytic	...	200	...	1	100	...	+ + + +
,, ,, ...	...	400	...	1	100	...	+ + + +
,, ,, ...	...	600	...	1	100	...	+ + + +
H—d to test Antigenic properties for Bilharzia	H—d	25	1½	1	100	100	— — — —
,, ,, ,,	,,	50	1½	1	100	100	— — — —
,, ,, ,,	,,	100	1½	1	100	100	— — — —
,, ,, ,,	,,	150	1½	1	100	100	— — — —
,, ,, ,,	,,	200	1½	1	100	100	— — — ±
,, ,, ,,	,,	300	1½	1	100	100	— — — +
H—d Anticomplementary	,,	...	1½	1	100	100	— — — —
Pooled Serum Control	Pooled	100	1½	1	100	100	— — — ±
,, ,, ,, ...	,,	200	1½	1	100	100	— — — +
Pooled Serum Anticomplementary ...	,,	...	1½	1	100	100	— — — —
Normal Serum Control	Normal	300	1½	1	100	100	— — — +
Normal Serum Anticomplementary ...	,,	...	1½	1	100	100	— — — —
Syphilitic Serum Control	Syphilitic	300	1½	1	100	100	— — + +
Syphilitic Serum Anticomplementary	,,	...	1½	1	100	100	— — — —

hottle containing the mixture being filled with CO_2 and kept stoppered and shaken at intervals. After some hours the acetone was poured off, and fresh dry acetone added, the bottle was again filled with CO_2, and stoppered as before. This was repeated, making three treatments with dry acetone. The dried livers were then placed in a test-tube and about 5 c.c. of absolute alcohol was added, the tuhe was filled with CO_2, and stoppered and shaken in a vaccine shaker 2 to 3 hours. The alcohol was then decanted off, a fine suspension of liver tissue in alcohol was obtained which was collected in a bottle which was filled with CO_2 and kept stoppered. This process was repeated 5 to 6 times. The collected extracts were then evaporated at room temperature (Egypt, December, 18°C. to 20°C.) by hubhling CO_2 through the mixture. A fine huff coloured powder consisting of the alcoholic extract and suspended liver tissue was obtained. The hottle was filled with CO_2 and sealed with paraffin wax. (This part of the process was completed on the 31st December.)

The dry powder so obtained was extracted with about 10 to 15 c.c. of absolute alcohol for 24 hours. The mixture was placed in the incubator at 37°C., for one hour of the 24 hours, to facilitate extraction, the bottle was frequently shaken. After extraction the mixture was filtered, and the clear alcoholic filtrate was collected in a test-tube of known weight (the residue was kept, see experiment III). The alcohol was removed under reduced pressure (10 to 30 mm.) at 40°C. The tube was re-weighed.

Test-tube	11·6855	grm.
Residue + Test-tube ...	11 7046	,,
(Antigen)	0·0161	,,

The resulting solid was emulsified with normal saline by vigorous shaking for half-an-hour at ordinary temperature. The proportion used 0·5 grm. solid : 20 c.c. saline (Fairley, 1919). The resulting emulsion was then used as antigen II. This second part of the preparation was carried out on January 17 to 21. The antigen, prepared in this way, should contain no protein ; only lipoids, fats, cholesterin and similar alcohol soluble compounds. (Table II.)

Antigen II. (1) shows no difference between the known positive Bilharzia serum and the known normal serum. (2) In the higher concentration it shows definitely more fixation of complement, both with a mixed normal and syphilitic serum and with a known pooled syphilitic serum. The addition of cholesterin made the antigen anticomplementary ; as was shown by the complete lack of hæmolysis in all tubes, to which were added 50 c.mm. 1 per cent. alcoholic solution of cholesterin.

III.—Antigen III extracted with 50 per cent. Alcohol.

The residue from II was placed in a bottle and ahout 4 c.c. of absolute alcohol + 4 c.c. of saline and placed in incubator at 37° C. for 24 hours, and was frequently shaken. The extract so obtained was filtered and the filtrate was collected in a test-tube of known weight. The solution was then evaporated hy placing the test-tube in a water bath and bubbling a stream of air through the solution. Owing to an accident the top of the tuhe was broken, and so the weight of the residue could not be obtained. The residue was then emulsified with about 3 to 4 c.c. of normal saline and filtered. The filtrate was used as Antigen III. This extract should contain various substances which are soluble 50 per cent. alcohol, diluted with physiological saline ; but it will not contain those substances which are precipitated by 50 per cent. alcohol. It will not contain more than minute traces of fats, cholesterin and lipoids. Since the fats and cholesterin are removed hy the preliminary treatment with acetone and the lipoids are removed by the alcohol (the possible exception is cuorin, which is insoluble in alcohol, being precipitated from its solution in ether by this reagent (Maclean, 1918, p. 75), it forms an emulsion in water, hut no statement as to its solubility in 50 per cent. alcohol diluted with physiological saline can be traced. Maclean (1918) (pp. 54 and 74) states that this compound is of doubtful existence. It is unlikely that it will contain any lipo-protein since these substances, if indeed they exist at all, are considered to be decomposed by alcohol at ordinary temperatures and even at 8° C. (Hardy (1910)). (Table III.)

The antigen is anticomplementary in large quantities, but not in 300 c.mm., and there is no anticomplementary adjuvant phenomenon (Thiele and Embleton (1914 (1)) to an appreciable extent with

Table III.—Residue from II Extracted with Equal Parts of Absolute Alcohol and Normal Saline, *i.e.*, 50% Alcohol.

Nature of Test.—III.	Serum 100 c mm.	Antigen III in c.mm.	Complement in Units.	Normal Saline in c.c.	Sheep Red Cells 10% in c.mm.	Amboceptor in c.mm.	Result.
Antigen Anticomplementary	...	300	1½	1	100	100	− − − −
,, ,, ...	...	600	1½	1	100	100	+ + + +
Antigen Hæmolytic	...	200	...	1	100	...	+ + + +
H—d. To test Antigenic properties for Bilharzia	H—d.	100	1½	1	100	100	− − + +
	H—d.	200	1½	1	100	100	− + + +
H—d. Anticomplementary	H—d.	...	1½	1	100	100	− − − −
Normal Control for Antigen	Normal.	100	1½	1	100	100	− − − −
,, ,, ...	,,	200	1½	1	100	100	− − − ±
Normal Anticomplementary	,,	...	1½	1	100	100	− − − −
Syphilitic Control for Antigen ...	Syphilitic	100	1½	1	100	100	− − − −
,, ,, ...	,,	200	1½	1	100	100	− − − ±
Syphilitic Anticomplementary ...	,,	...	1½	1	100	100	− − − −

serum in the concentration used as is shown by the two controlled pooled sera. This antigen is quite a definite one for bilbarzia; the readings were quite clear, and the haemolysis in the case of the known bilharzia serum, with 200 c.mm. of antigen, was only demonstrable by centrifuging.

IV.—Antigen IV extracted with Absolute Alcohol.

In order to test whether the positive result obtained with Antigen II with the syphilitic serum could be attributable to the infection of the snail with *S. mansoni*, a similar antigen was prepared from the livers of *P. boissyi* infected with echinostoma employing the same mode of preparation as that employed for Antigen II. (Table IV.)

This antigen appears to be comparable with Antigen II, but rather clearer readings are obtained. It shows no antigenic power for either normal serum or for the serum of the patient infected with Bilharzia. It shows increasing antigenic properties, proportional to its concentration for a pooled serum which was known to have given a positive Wassermann reaction.

TABLE IV.—ANTIGEN EXTRACTED WITH ABSOLUTE ALCOHOL FROM LIVERS OF PLANORBIS BOISSYI INFECTED WITH ECHINOSTOMA.

Nature of Test. IV.	Serum 100 c.mm.	IV. Antigen in c.mm.	Complement in units.	Normal Saline in c.c.	Sheep Red Cells 10% in c.mm.	Amboceptor in c.mm.	Result.
Antigen Anticomplementary	...	300	1½	1	100	100	− − − −
,, ,, ...	...	600	1½	1	100	100	− − − +
Antigen Hæmolytic	...	200	...	1	100	...	+ + + +
H—d for Antigenic props. for Bilharzia	H—d	100	1½	1	100	100	− − − −
	,,	200	1½	1	100	100	− − − −
H—d-Anticomplementary	,,	...	1½	1	100	100	− − − −
Normal Antigen Control	Normal	100	1½	1	100	100	− − − −
,, ,, ,, ...	,,	200	1½	1	100	100	− − − −
Normal Anticomplementary	,,	...	1½	1	100	100	− − − −
Syphilitic Antigen Control	Syphilitic	100	1½	1	100	100	− − − −
,, ,, ,, ...	,,	200	1½	1	100	100	− − + +
,, ,, ,, ...	,,	300	1½	1	100	100	+ + + +
Syphilitic Anticomplementary ...	,,	...	1½	1	100	100	− − − −

TABLE V.—SUMMARY.

Serum	Saline I.	Absolute Alcohol II.			50% Alcohol.	50% Saline III.	Absolute Alcohol IV. Echinostoma		
100 c.mm.	100 cm.	100 c.mm.	200 c.mm.	300 c.mm.	100 c.mm.	200 c.mm.	100 c.mm.	200 c.mm.	300 c.mm.
H—d	+ + + +	− − − −	− − − ±	− − − +	− − + +	− + + +	− − − −	− − − −	...
Normal ...	− − − −	...	...	− − − +	− − − −	− − − ±	− − − −	− − − −	...
Syphilitic ...	− − − −	...	...	− − + +	− − − −	− − − ±	− − − −	− − + +	+ + + +
Normal + Syphilitic	− − − −	− − − ±	− − − +	...	...	...	...	...	...

CONCLUSIONS.

The fact that Fairley (1919) found the alcoholic antigen more efficient may be due to the greater solubility of the active principle in alcohol diluted with physiological saline than in physiological saline alone. Or it may be due to the increase of the number of positives by the presence of some slightly anticomplementary substance such as cholesterin (Thiele and Embleton (1914 (1)). The relatively poor results obtained with Antigen III may be due to the partial coagulation of the substance by the prolonged alcohol treatment resulting in a very dilute solution being obtained; or it may be due to its destruction by keeping. Fairley (1919) advises that the antigens should be prepared as fresh as possible, and that they lose their antigenic power on keeping.

In regard to the positive results obtained with syphilitic sera, antigens employed in the Wassermann reaction are alcoholic or ethereal extracts of various organs, and the alcohol-soluble, acetone-insoluble fraction is employed. So that, whilst snails' livers have not been previously used as a source for Wassermann antigens (mammalian livers are largely used) and efficient Wassermann antigens can be prepared from invertebrates (cf. Brauer (1911), Violle et Le Saint-Rat (1920)), the positive results obtained are not surprising. The concentration of the alcoholic extract employed was less than that used in the preparation of Standard Wassermann antigen (in the proportion of 25-30) which may account for better results being obtained with larger quantities of antigen. Good results were shown by the extract obtained from the Echinostoma infected snail. The fact that Fairley (1919) found his antigen inactive with syphilitic sera may have been due to the very much smaller concentration of lipoids which his antigen would contain—(the percentage of solids employed in both cases being the same)—and his antigen probably containing in addition some emulsified fats and cholesterin as well at the active antigen.

From the results obtained it would appear that the antigenic substance, acting in the test for Bilharziosis,

is insoluble in absolute alcobol and acetone; since the treatment of the material by these two reagents did not remove it; and it was not present in the alcohol solution fraction. Further, the antigenic substance cannot have been destroyed by prolonged treatment with acetone and absolute alcohol, nor irreversibly precipitated by them; since it would not then have been found in solution in the subsequent treatment witb 50 per cent. alcohol.

It must be soluble to some extent in physiological saline, since extracts with this solvent yield an efficient antigen. Further, it cannot be insoluble in a considerable concentration of alcobol, for Fairley (1919) found that his alcoholic antigen, extracted by absolute alcohol which was diluted by the tissue water-content and by the water necessarily accompanying the liver, was a very efficient and specific antigen. The substance is soluble in 50 per cent. alcohol diluted with physiological saline; as is shown by the reactivity of Antigen III, which was prepared from the material after the previous removal of fats, cholesterin and lipoids, by successive treatment with alcohol and acetone. (The possible exception being cuorin, see Antigen III above). It is to be noted that the solid remaining after the extraction of Antigen II was only a small quantity of the total bulk of the livers; consisting of the fine suspension in the alcoholic extract made in Egypt whicb was not filtered but decanted, before desiccation for bringing back to England. Since only a very small proportion of this was soluble in 50 per cent. alcohol the antigenic substance must be extremely active.

There seems some difficulty in classifying it by its solubilities in the recognized classes of proteins. The solubility character of the class of alcohol-soluble proteins—the Prolamines—which are insoluble in absolute alcohol and insoluble in water, but are soluble in 50 per cent. to 85 per cent. alcohol, would appear to be coincident with that of the antigen. But so far these have only been recognized among the vegetable proteins. (Osborne and Voorhees, Osborne and Chittenden, Osborne and Harris and others (1891-1893)).

Scbryver (1909) states that on the addition of an equal volume of alcohol to a 2 per cent. solution of Witte's peptone, *a*-proto-proteose and *a*-deutero-proteose remain in solution.

Mayer (1907) found that some proteins, e.g., serum albumen, *if dialysed*, were soluble in very dilute neutral salt solutions, containing as much as 80 to 85 per cent. of alcohol. If they were *not dialysed* they could not be dissolved by dilute alcohol except in the presence of strong alkali.

Victor (1907) found that by extraction with 99 per cent. alcobol, concentration, and subsequent solution in aqueous alcohol, jecorins were obtained as a precipitate by the addition of 99 per cent. alcobol. These artificial jecorins, like the "natural" jecorins, are soluble in aqueous alcohol, but are precipitated by pure alcohol. It will be noticed that in tbis mode of preparation, which was devised by Drechsel (1886), they are obtained from the alcobolic extract. Maclean (1918), p. 156, considers them an artificial product. They are generally obtained from mammalian liver tissue.

In spite of tbe difficulty of its classification with the proteins, it seems unlikely the antigen is lipoidal in character, since it is not present in the alcoholic extract. It is improbable that cuorin should be a specific antigen. It is unlikely to be a lipo-protein as was shown above. (Antigen III, above.) So far, only proteins, or possibly lipoids, or substances accompanying them, have been shown to be antigenic. Therefore, it seems that the activity of tbis antigen is to be attributed either to a substance of a protein class, or some active principle associated with protein as yet unidentified and unclassified.

My best thanks are due to Professor Leiper, for enabling me to carry out the work: not only by providing the material and the opportunity to begin the preparation of the antigens in Cairo in conjunction with his Mission to Egypt. But also for the interest which he has so kindly taken in it, and the assistance which he has given me throughout. Owing to the kindness of Dr. F. H. Teale, I have been able to continue the work in London in the Bacteriological Laboratories of University College Hospital Medical School; and I also owe much to his advice and supervision. I am indebted to the Department of Helminthology of the London Scbool of Tropical Medicine, for providing the snails for the saline antigen; and to Dr. J. B. Christopherson, C.B.E. or obtaining the bilharziosis serum.

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BRIEF NOTE ON A CASE OF ELEPHANTIASIS OF THE VULVA.

By J. G. MacNaughton, M.D., M.R.C.P.
S. M. O. Tanganyika.

At Shinyanga, in the interior, where elephantiasis is very common, I have recently come across a case of elephantiasis of the vulva of very large dimensions; in fact, it is the largest I have met so far. The case is depicted in the two photographs annexed, showing anterior and posterior views of the lesions. I hope to remove it shortly, but until then, of course, its weight cannot be ascertained.

Elephantiasis vulvæ

Posterior view.

The Malaria Danger (L. H. Hughes, W. Evans, and E. W. Ferguson, *Medical Journal of Australia*, vol. i, No. 21, May, 1921).—Ferguson, writing from New South Wales, reports that several species of anophelines have been found in Australia, among which are the following: *Anopheles corethroides*, *A.* (*Myzorhynchus*) *barbirostris bancrofti*, *A.* (*Pyretophorus*) *atratipes*, *A.* (*Nyssorhynchus*) *annulipes*, and the common Australian mosquito, which extends from Tasmania to the islands in the north. The danger of malaria, however, is considered slight, as there are few mosquitoes in the urban areas and few human beings in the rural ones. All settlers known to have suffered from the disease are excluded from the Murrumbidgee area, which is the one exception.

Evans, who in 1919 had grave apprehensions of an outbreak of malaria in Australia, now thinks such an outbreak unlikely.

Yellow Fever: Its Distribution and Control in 1920 (W. C. Gorgas, M.D., H. R. Carter, M.D., and T. C. Lyster, M.D., Yellow Fever Commission of the International Health Board, Rockefeller Foundation).—Yellow fever areas have been enormously reduced in size; those now existing, with the exception of the Yucatan Peninsula, are well under control; and reasonable hope exists of eventual elimination.

Epidemics are becoming less and less widespread, due to the intelligent methods of combating the disease now in force, which consists of walling off infected areas and lowering the stegomyia index around them.

The ætiology, pathology and treatment—both curative and preventive—are being rapidly put into conclusive form. Co-operation of Latin-American countries, with the exception of Mexico, has been brought about, so that the disease is now being combated under unified control, in so far as outlining the plan of warfare is concerned.

It is believed that immunity from yellow fever is positive, permanent and acquired; and that anti-stegomyia campaigns alone are sufficient for the elimination of the disease.

Oriental Sore (D. King Smith, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 1, January, 1922).—After studying four cases of oriental sore, the author is of the opinion that the inoculation period varies from six to eight weeks. The condition is auto-inoculable. Röntgen-ray treatment with arsphenamin or neo-arsphenamin is worthy of a trial.

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MARCH 1, 1922.

MARCH.

NORTH of the Equator the spring is with us and malaria has begun to show itself, whilst south of the Equator the autumn malaria is still more pronounced. The husbandmen are in the field in March and September, the former preparing the ground to receive the seed, the latter gathering in the grain. In both latent or newly acquired malaria is rife. It is with the field work that malaria is associated and with the village in which the peasant resides. In Britain the old-fashioned term of a "spring clean" obtains, but instead of Warburg's tincture, the "fever powder," and such-like are replaced by "sulphur and treacle" or a "course of morning salts," or dosing with decoctions of herbs plucked in the woods by wise women and handed round to the villagers and peasants. In large towns the old custom has died out for the most part because the necessity has disappeared, as the mosquito attacks the inhabitants of the suburbs only, and reinfection does not occur amongst those who dwell in the central parts, where the pavements are impregnable, the grass and herbage rudimentary, and the breeding places for mosquitoes, except amongst the reeds and water plants by the ornamental ponds and lakes, are non-existent.

In the spring and autumn, boils, whitlows and carbuncles are also prevalent, suggesting that the "blood is out of order," explaining the necessity for treatment by bleeding, purgation, change of water as the Chinaman terms it and other countries change of air. One naturally asks what connection, if any, is there between malaria and these manifestations of spring and autumn necrosis of tissues, and our quondam enemy malaria in Britain and in other countries which now are more or less apparently freed from evidences of "fever." These hidden evils lurking in recesses which seem unfathomable begin to declare themselves, and seemingly obey Nature's call to all that mystery we call climate. We have solved and explained many of these mysteries, exposing them to the broad daylight of science. Yet much remains to be done and show how the spring infections of the Northern Hemisphere are co-temporary with the autumnal infections of the Southern and vice versa. The mysteries of spring are as yet unfathomed in fields outside disease. On a certain day in February usually associated with the 14th, birds which but yesterday were grouped in families, to-day break up into pairs, and henceforth commence the breeding season. How far this period affects animal life generally has not been so carefully observed, and a great field for investigation is lying open to us. The domestic animals of our farms are affected about the same period, and the hurry to bring off the prevalent weddings before the period known in the church as Lent, during which time marriages in several religious sects are discouraged, may have the same explanation amongst human beings.

A common practice followed by many medical men is to adopt a spring and autumn dosing with drugs for men who have had syphilis. A "spring clean" and an "autumn purifier" was, and is, and should be followed by syphilities even in old age if they hope to escape one or several of the sequelæ of syphilis. The intensified treatment of to-day by "606" and allied hustling forms of treatment does not undo the necessity for the two or three

years' course of mercury if one hopes to annul possibilities of sequelæ appearing in middle or old age or in one's children. Moreover, we know that even after what is termed full treatment by mercury, several affections, more especially skin and nerve troubles, are apt to appear and harass old men, troubles which are ascribed to gout yet disappear readily under anti-syphilitic remedies. Experienced men—that is, medical men of many years' experience in the practice of medicine—advise their old syphilitic patients to take a course of iodide of potassium every March and October as long as they live if they wish to prevent latent syphilis showing itself. Few, very few will observe this regime. They believe by a six-weeks course of baths at this or the other Continental spa or a course of "606" is all that is necessary, and state positively their present ailment cannot be syphilis when the doctor suggests such a thing. Were the recommendation of these experienced practitioners followed, there would be fewer, or shall we say none, of the spinal cord affections of men of fifty or the tongue plaques or general psoriasis of old age. But why the spring and autumn dosing in such an ailment as syphilis, which seems to have nothing to do with intermittency of appearance and manifestation? Is it truly associated with the periods of the rise and subsidence of the sap in plants, or is it a habit, a custom, an experience, a—call it what you please—routine, if one likes it better, dependent on experience gained in the treatment of malaria. Possibly it is so, and the habit has gone beyond the doctor's advice and recommendations for it has continued amongst dwellers in countries which were once malarial and are no longer so. The country folk in many remote places in the fen country in England, and in Norfolk, Suffolk, &c., still, or did so until a few years ago, ask their chemists for the "fever powder or mixture" in spring and autumn as their forefathers did. They declare they "feel better for it," without inquiring the reason why. Malaria was well-nigh universal in Britain, in Belgium, in Holland, and countries as far north; yet even in these northerly latitudes the malarial habit of drugging in spring and autumn became a custom—a regime which led to the "spring-clean" habit and the "autumnal humour purifying" when malaria was no more in being. The farmer who in spring brought in his fat cattle to the market town to be sold was bled regularly by the barber-surgeon who cut his hair, and bled him at the same sitting. The same regime occurred in October when he brought his corn at the Martinmas term to market to be disposed of, and again he was bled. The effect of this procedure established the spring and autumn habit which still lingers with us, and has created a halo round a custom which in the modern medicine, and especially amongst town dwellers, has come to be neglected as a worn-out and exploded idea and worthy only of the days of "humours" and "wise women's talks. To uproot a custom is difficult, and the malaria periodicity tinges our therapeutic practices of to-day.

There would seem to be ailments which the seasons affect, not only in malaria, but possibly in many, if not all ailments. Some parasites declare themselves only in the dark, some in bright light, some in warm, some in colder climates, each having their periods of activity and of quiescence; in other words, seasons and climates determine manifestations of disease, so that climate, beyond the mere term "climatic diseases," has a potency of which we know little beyond the mere parasites that occasion them. In our text-books nowadays climate is finding a chapter or two which shows a growing tendency to expand and to claim the attention of students of medicine.

To the "all-parasite-finder-believer" in disease the above reflections will seem unworthy of a scientific journal, but we would remind even these men that malaria is more often not found in the blood in latent malaria than otherwise, and that in an old tropical resident who has left the tropics to dwell in a temperate climate, malarial parasites have been found in his or her blood after an interval of some nine years. Many medical men believe that once having had malaria all febrile attacks from other causes are "tinged" by malaria for many years, or it may be for all his or her lifetime afterwards. Let us see to it that we do not fold our hands in self-complacency and believe that this or that branch of medical knowledge is proved to the hilt and done with, but listen to the advice of Sir Ronald Ross and investigate more deeply than we have done, and go on with this interminable fight against disease by every method available.

J. Cantlie.

Annotations.

Lichen Planus et Acuminatus Atrophicans (Samuel Feldman, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 1, January, 1922).—The author describes a case which he thinks is identical, clinically and microscopically, with those described by Hallopeau and others under the title of lichen atrophicus or sclereux. The mode of origin of the atrophic patch also logically points in that direction. What has not been accounted for is the generalized eruption of acuminate papules situated outside of the depigmented patches. In spite of the fact that the papules were smaller and the plugs more filiform than in typical cases of lichen acuminatus, these points of difference are insignificant compared with the many points of similarity of that eruption with the disease mentioned above. It is only necessary to mention the microscopic findings, the extreme itchiness, and the deep red colour of the papule for a period of more than a year after the onset of the disease, and the rapid progress of the patient towards recovery after arsenic treatment, to establish the identity of the case with lichen acuminatus. On the

other hand, the age of the patient, the occurrence of the eruption in conjunction with typical lichen planus lesions, and its appearance on the chest, which, according to Crocker, never occurs in lichen spinulosis, are strong points against its having any relation to the latter disease, the only one with which it might possibly be confused.

Notes on Bismuth as a Trypanocide (S. Adler, M.B., *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 4, December, 1921).—The effect of bismuth in the form of soluble bismuth sodium tartrate in solutions of various strengths was tried on animals infected with *Trypanosome rhodesiense* and *T. brucei* (*Nagana ferox*) respectively. Using this drug, the minimum lethal dose for healthy mice was found to be 0·047 grm. of bismuth, and for healthy guinea-pigs 0·062 grm. of bismuth per kilo. body-weight.

In animals which died after injection of bismuth sodium tartrate, depots of bismuth were found in all cases in the liver, frequently in the spleen, and less frequently in the kidneys.

T. rhodesiense.—The minimal lethal dose cleared the blood of trypanosomes in a mouse within twenty-four hours, but the animal died in two days. Any dose below this failed to clear the blood of trypanosomes.

T. brucei.—Although the drug cleared the blood of trypanosomes in guinea-pigs, yet relapses occurred in a few days, and in no cases were cures obtained.

Epitheliomas of the Face and their Treatment with Radium (Harold Morrow, M.D., and Laurence Taussig, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 1, January, 1922).—In the treatment of basal-cell carcinoma of the face it is seldom necessary to employ buried bare tubes. Surface application, except in the deeply infiltrated and very extensive cases, is usually satisfactory.

In the great majority of squamous-cell carcinomas, buried bare tubes used in conjunction with surface applications have been very helpful. In the radium treatment of deep carcinomatous infiltrations, buried bare tubes are almost a necessity.

Malaria on a Venezuelan Oilfield (J. W. W. Stephens, M.D., F.R.S., *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 4, December, 1921).—The oilfield was situated in lat. 9°.75′ N. and long. 71°15′ W. The indoor temperatures in August ranged from 85°-89.5° F. maxima to 75°-81.5° F. minima. Heavy rain lasting about half an hour fell towards evening on five out of twenty days.

The only species of anopheline found in the area was *Cellia argyritarsis*, distinguished by having three and three-quarters hind tarsis almost completely white. The palmate hairs of the larva of this species are variable. Usually there are palmate hairs on segments two to seven, that on segment two being small and hard to see. Examples were also found with well-developed palmate hairs on segments one to seven, together with a well-developed thoracic palmate hair.

Examinations of sixteen specimens of *C. argyrotarsis* for sporozoites proved negative, but Tovar states that this species transmits in Venezuela.

The small fish which abounded in the small streams and in the swamps of the district belonged to the following species: *Gambusia* (*Poecilia*) *tridentigera*, *Haplochilus* sp., and *Chromides* (*Acara*) *dorsidera*.

Studies on the Effects of Tuberculin (Peter M. Holst, *Journal of Hygiene*, vol. xx, No. 4, December, 1921).—In order to obtain knowledge of the fate of tuberculin in the organism the substance was injected into normal animals. After injection tuberculin rapidly disappears from the vascular system, and does not reappear in the urine until after several hours. In the meantime the substance is bound in the organism, probably in the bones and in the liver. Living cells *in vitro* also have the faculty of binding tuberculin.

Through numerous experiments a difference is demonstrated between the complements of different sera, a fact which strongly supports the theory of the plurality of complements. Evidence is brought forth which points to a difference between tuberculous and non-tuberculous complement.

Tuberculin is highly noxious to the vitality of the white blood corpuscles, and more toxic to corpuscles from tuberculous organisms than from non-tuberculous organisms. A certain protective power in regard to the toxic action of tuberculin is found in the serum. This power is greater in serum from normal organisms than in serum from tuberculous organisms. By means of vital staining a difference is demonstrated between the effects of tuberculin upon the leucocytes from normal and tuberculous animals.

The Fatty Acids of Chaulmoogra Oil in the Treatment of Leprosy and other Diseases (H. T. Hollmann, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 1, January, 1922).—The author is of the opinion that in the fatty acids of chaulmoogra oil, either in the form of sodium salt or in the ethyl ester, there is a remedial agent that will cause a disappearance of the leper bacilli and the lesions of the disease if administered over a sufficiently long period.

All patients who give a bacteriologically negative reaction should continue under observation and treatment for at least two years more. From the results obtained in two cases of lupus, the ethyl esters of chaulmoogra oil fatty acids should be given a trial in cases of this disease, as well as in other forms of tuberculosis.

Abstracts and Reprints.

TYPHOID SPINE[1]

By Barclay W. Moffat, M.D.

The incidence of typhoid spine—first described by Gibney in 1885—is given by one observer as one in 1,800, and by another as one in 6,905 cases of typhoid fever. The greater proportion occurs in males owing to their greater liability to trauma, and in the lumbar region, because these vertebræ suffer greater strain and also contain more cancellous bone, a favourable nidus for *Bacillus typhosus*. In cases of typhoid, necropsies have demonstrated its presence in this situation, though no spinal symptoms were noted throughout the course of the disease.

The pathologic process of the condition has been classified by Terrillon as (1) simple periostitis; (2) osteitis with subperiosteal abscess; and (3) periostitis with osteitis.

Osler maintained that the disease was purely a neurosis. The one necropsy reported—that by Rugh in 1915—showed that the disk between the third and fourth lumbar vertebræ was missing and had been replaced by a bony overgrowth. On section, connective tissue, rich in blood supply, sufficient to cause ankylosis, was found replacing the cartilage and bridging over the space of the disk.

The onset of spinal symptoms varies in time from the third week of the disease to four years after its termination. Bohmansson points out that *B. typhosus* may be latent in an individual giving a negative Widal reaction until stimulated by vaccine treatment, and may still give rise to symptoms. He reports such a case presenting acute hip symptoms, and concludes that typhoid bone lesions may result in a case which has never presented the clinical picture of typhoid fever at any time.

Murphy, however, reports a case in which the onset of the fever occurred in May, though the spinal symptoms did not appear until September of the same year, and explains this by deposition of the bacillus in the vertebræ from the blood of the patient as a carrier at the time of the onset of the spinal symptoms, because of trauma which provided a favourable soil.

The average case begins with a gradual onset, usually after the febrile state of the disease has passed. The temperature is elevated to a point usually less than 103° F., and the rise in pulse rate accompanies it. The leucocyte count ranges from 6,000 to 18,000. The patient is anxious and there is usually great mental irritability.

The complaint is usually of pain at the site of the lesion on twisting or jarring, though this may be obscured by the referred pains. The spine is carefully guarded against abrupt movements.

At the lesion, the muscles are rigid and the spinous and transverse processes are painful on pressure. There is found a kyphosis in comparatively few instances. In only four cases has there been suppuration requiring drainage.

The referred symptoms sometimes seen are severe radiating pains to one or both sides of the chest, abdomen, or scrotum, and either arm or legs. Less commonly there has been described a rhythmic contraction synchronous with the pulse, believed to be due to pressure through masses of exudate about the spinal roots at the foramina. In one case these contractions were stopped by pressure on the abdominal aorta. In a few cases there has been described hyperæsthesia or paræsthesia. Muscular atrophy is infrequent. The knee-jerks are usually exaggerated.

The differential diagnosis is made from neurasthenia, tuberculosis of the spine (Pott's disease), and lumbago. The relief from fixation is not immediate, as in tuberculosis of the spine, nor absent, as in neurasthenia. Lumbago is transient.

Spondylitis deformans could hardly be confused with typhoid spine, the lesion in the latter being more circumscribed.

The prognosis of life is, of course, perfectly good. There is often more or less complete ankylosis, owing to absorption of the disks. Relapse to the extent of a return of pain may follow too early discarding of support.

The treatment is fixation by plaster-of-Paris jacket, traction, or brace.

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxvi, No. 10, March, 1921.

BRONCHOMONILIASIS.[1]

By Tarakenath Sur, M.D.

This is to record here a very interesting case of bronchomoniliasis which I casually came across, while examining the sputum of a European gentleman, supposed to have been suffering from chronic pulmonary affection with a suspicion of tuberculosis.

The sputum was sent to me for examination. I could not detect any tubercle bacilli, but a yeast-like organism was present in large numbers which, when grown, was found to be a *monilia*. The history of the case is as follows:

The patient, a European male, aged 53 years, belonging to Civil Veterinary Department, at present posted in Calcutta, is said to have been suffering from a troublesome cough, off and on, for over a year. The onset of his present illness dates from April, 1920, when he exposed himself one day while on leave at home in England on a very chilly day, and got a bad cold, which left him in a couple of days with a very troublesome cough. He consulted two eminent physicians in June and July, 1920, but none could detect any gross lesions in his lung and treated him for ordinary bronchitis.

[1] Abstracted from the *Indian Medical Gazette*, December, 1921.

In July, 1920, while returning home after playing golf on a wet day, he felt a shooting pain in his chest, so severe that he could hardly lie down in bed; there was great difficulty in breathing. The attending physician warned him to be careful as he had an attack of pleurisy. Since then, during the rest of his stay in England, he suffered off and on from asthma-like fits, and when he came out to India he continued suffering more or less from then till June, 1921. All during this time he was in a bad state of health with troublesome cough and occasional evening rise of temperature, the expectoration at times being tinged with blood. He was gradually losing weight and lost nearly a stone and a half, and became too weak to carry on his work. Often he had to pass many a wakeful night due to prolonged hard breathing.

In November, 1920, he had several attacks of severe pain in his loins, being more marked on the right side. His consulting surgeon suggested that they were due to renal stones. A radiographic examination was made by an expert and nothing like renal stone was found.

A short time after this he noticed his left testicle was very swollen and tender, but all subsided with complete rest and treatment in a couple of days. Soon after his liver was enlarged and painful. There were coarse pleuritic friction sounds at the level of the diaphragm on the right side, accompanied by well-marked pain in his right coracoclavicular joint. There was an evening rise of temperature, and one day after some troublesome cough he brought up a quantity of sputum tinged with blood which looked like liver-abscess pus, and so, with a suspicion of abscess in the liver, five 1-gr. doses of emetine were injected. The pain and enlargement of the liver subsided gradually. The sputum was then examined, but nothing definite of hepatic origin could be traced; neither could any tubercle bacilli be found, but a large number of yeast-like cells were present.

In February, 1921, he again felt severe pain in his chest, being more marked on the left side. Pleuritic friction sounds were audible low down on both the bases along the line of the diaphragm, the rasping character of the sound being more marked on the right side. Great relief was felt with the application of hot linseed poultices. The asthma-like fits were present all along.

On June 20, 1921, while coming down the river Hughli in a steam launch, he had an exposure to chill again, and got an acute attack of pleurisy with patchy pneumonic consolidation in both the lungs. Frictions and crepitant râles were audible over the affected areas. The temperature rose to 104° F., and remained so continuously with one degree variation for three days; and then, with the specific treatment mentioned hereafter, the temperature came down to normal by lysis in five days. On the night of the attack he was cyanosed, and his breathing became very hard and felt so tight at times, as if he was passing away altogether. With the help of medicine and hot poultices he was somewhat relieved, but he was rather alarmed and surprised at coughing up fresh blood with each expectoration. The hæmorrhagic character of the sputum continued for three or four days.

The attending surgeon, finding the clinical picture and the character of the sputum quite unlike that of ordinary lobar pneumonia, had the sputum analysed; the analysis revealing the presence of many monilia, a diagnosis of bronchomoniliasis was made on the fourth day of the disease. The patient was then put under the specific treatment, and made an uninterrupted recovery within five or six days, during which the sputum became scanty and free from blood. The patches of consolidation cleared up gradually, and the chronic troublesome cough subsided altogether. The patient felt quite easy and comfortable and rather surprised that he could feel so well in such a short space of time.

Treatment.

The specific treatment commenced from July 1, i.e., on the fifth day of the last attack of his illness. He had at first 20 gr. of potass. iodide in a mixture three times a day till July 5, and 30 gr. thrice daily till July 10, and subsequently 45 gr. thrice daily till July 28, 1921; when the symptoms of iodism appeared the drug was discontinued.

Besides the iodide treatment he had four injections with autogenous vaccines prepared from a twenty-four hour pure culture of monilia, strength being about 100 millions of the organism per each cubic centimetre. The doses consisted of 20, 40, 70 and 100 millions respectively, and given at an interval of two, three and four days. There was no difficulty in preparing the vaccine, as a good emulsion could be made with normal saline solution from a twenty-four hour culture.

The patient at present is still under observation and is doing very well.

THE DEVELOPMENT OF THE JAPANESE BLOOD-FLUKE, *SCHISTOSOMA JAPONICUM* KATSURADA, IN ITS FINAL HOST.[1]

By William W. Cort, Ph.D.

The contrast is very striking between the cercaria of *Schistosoma japonicum*, in which the structure of the body is greatly modified by adaptive larval characters for locomotion and penetration, and the adult in which the sexes are separate and there is an extreme sexual dimorphism. Sexual dimorphism has never been demonstrated in the cercariæ of the human schistosomes, although the finding of a size dimorphism in a closely related species of schistosome cercaria suggests that undetected differences may be present. The finding by Japanese workers, that when an experimental host is infected with cercariæ of *S. japonicum* from a single snail, all

[1] Abstracted from the *American Journal of Hygiene*, vol. i, No. 1, January, 1921.

the resulting individuals are in the great majority of cases of the same sex, and my own findings that in the schistosome cercaria from Douglas Lake, in fifteen snails studied, all the cercariæ from a single snail were of the same type suggests the theory that sex in the schistosomes is differentiated in the miracidium stage, and that all cercariæ which develop from a single miracidium are of the same sex.

The work of Japanese investigators on the life-history of *S. japonicum* has demonstrated that infection with this species is always by penetration of the cercaria through the skin or the oral or pharyngeal mucous membrane, and never by way of the digestive tract, and that the cercaria can penetrate easily at any point through wet skin, although they most frequently enter by way of the hair follicles. The course by which the larval blood-fluke reaches the blood-vessels of the liver has been the subject of considerable controversy. Soon after exposure to infection the larvæ will be found in the epidermis, dermis and subcuticula, and later most of them enter the small blood-vessels and lymph spaces. They are carried to the heart, either by the venous system or by the lymph vessels, although the former seems to be the most frequent course, since most of those which get into the lymph system seem to die in the lymph glands. From the heart they are carried to the lungs. From the blood-vessels of the lungs two courses have been traced. The first course is through the capillaries of the lungs back to the heart, from the heart by the arterial system, and through the capillaries to the hepatic portal system. Those larvæ which follow the second course, which is probably by far the most frequent, leave the blood-vessels in the lungs, penetrate through the lung tissue, enter the peritoneal cavity by way of the connective tissue of the posterior mediastinum and to a lesser extent of the anterior mediastinum, following with preference the course of the large blood-vessels and nerve trunks and finally penetrating the liver, where they enter the hepatic portal system.

Soon after penetrating through the skin, the tail of the cercaria is lost and the cephalic and head glands degenerate. There is very little increase in size until the larvæ reach the liver, although the digestive system becomes organized for functioning, and the oral sucker begins to assume its true character. In the earliest stage found in the liver it is impossible to distinguish the sexes, but at the stage between 0·3 mm. to 0·4 mm. the males show distinctly large suckers, and a broader body than the females, and the females have a broader area in front of the union of the intestinal cæca, where the ovary later develops.

To attain the largest size recorded for this species the cercaria must increase in length over 100 times. The most rapid period of growth is from the time of reaching the liver to sexual maturity, when the worms may increase their length in less than twenty days by twenty to thirty times. Growth continues after sexual maturity but is much slower. The finding of larvæ as small as 0·3 mm. in the liver, up to eighteen days after infection, can be explained by postulating that the worms grow but little in size until they reach the liver, and that there is a variation in time for the migration course. The increases in size are almost entirely in the post-acetabular region. As growth goes on, there is a very great increase in the ratio of length to width, which is much greater in the female than in the male. The body of the female soon becomes round in cross-section, while in the male the post-acetabular region gradually becomes flattened, and the sides grow up to form the gynæcophoric canal.

The size of the suckers increases greatly in the course of development, but not in proportion to the increases in body size. In the males this increase is much greater than in the females. In the cercaria the ventral sucker is only about one-third of the diameter of the oral sucker. In an early stage of development the suckers become about equal in size, and in later stages the ventral sucker is constantly larger than the oral sucker. The ventral sucker with increase in size becomes thinner, and juts out from the body, until in later stages it is saucer-shaped and has a distinct peduncle. The greatest change in the oral sucker is the great increase in the size of the mouth and buccal cavity.

From the very rudimentary condition of the cercaria the digestive system becomes horseshoe-shaped, and very much distended with food material. The ends of the intestinal cæca unite at a stage of about 0·4 mm. in length. The divided and united portions both extend greatly to keep pace with the increased length of the body. In the female the position of the point of union of the intestinal cæca and the greater width of the area in front of this point as compared with the male is influenced by the development here of the ovary. Differentiation of the reproductive organs comes late. Although at an early stage the *anlage* of the ovary can be distinguished, it is not until the female attains a length of about 1·5 mm. that the outlines of the ducts and other organs can clearly be made out. In the male it was only in specimens over 2 mm. in length that the outlines of the testes could be clearly distinguished.

A CASE OF MYIASIS OF THE FRONTAL AND ETHMOIDAL SINUSES AND THE ORBIT.[1]

By Major R. E. Wright, M.B., I.M.S.

On November 23, 1920, a Hindu woman named Rangamma, aged 30, was led into the out-patient department of the Government Ophthalmic Hospital, Madras, as she was unable to see. She had an offensive odour, and on unwrapping a cloth from the region of her forehead, the reason was obvious. The supra-orbital and inter-orbital region from the external angular process on the left to ¾ in. beyond the middle line on the right was represented by a

[1] Abstracted from the *Indian Medical Gazette*, vol. lvi., No. 2, February, 1921.

large gutter full of muco-pus and grey sloughing material, alive with maggots. Not only had the skin of the brows been destroyed over this area, but the glabella, nasion, and left superciliary ridge had disappeared, together with the orbital plate of the frontal bone on the left and part of that on the right. The lacrymals had disappeared, and the ethmoid was undergoing carious destruction. The frontal sinuses above, the ethmoid cells and nasal fossæ below, and the apex of the right orbit behind, were involved in the base of the ulcer. The dura was not exposed. The eyeballs bounded the ulcer externally, both were proptosed and pushed to the temporal sides, the left more so than the right. The corneæ were covered by the œdematous upper lids, which drooped owing to the severance of their attachments above, and to the inner side. The left cornea showed a large central ulcer; the right was healthy.

Right eye vision = fingers at one foot.
Left eye vision = P.L.

The upper and right margins of the ulcerated area were markedly elevated, being composed of a gummatous mass which shelved away into healthy tissue high up on the forehead. There was a copious discharge from the anterior nares. The patient was very weak, her pulse feeble, and the temperature subnormal. She was admitted into hospital, and the foul-smelling cavity cleaned up by irrigation with permanganate solution, turpentine applications, cutting away of sloughs, and removal of the maggots with forceps, about fifty of which were extracted in this way. She was put to bed and given liquid diet and stimulants, and carefully tended. Frequent irrigations with chlorine solution and loose packing with iodoform gauze was adopted. The morning after admission, although a great deal of time had been spent removing the maggots the evening before, about thirty additional ones were taken out. After this no more living specimens were found. The prognosis is good for life, but it is improbable that the left eye will be of any use as the muscular attachments are destroyed, and the cornea is badly ulcerated. She may get useful vision with the right eye, and muscular action may be partially restored, as apparently the muscles of the eye-ball are not involved in the necrotic process. In addition to the local treatment referred to above, the patient is, of course, receiving energetic anti-syphilitic treatment.

Entomological Note.

By W. S. Patton, M.B.

Major Wright sent me two batches of living larvæ, as well as others preserved in spirit and formalin, collected from the case described above; they all proved to be the mature larvæ of *Chrysomyia bezziana* Villeneuve. It will be remembered that this fly is the specific myiasis-producing Calliphorine of India, only depositing its eggs in the diseased tissue of man and animals. A complete description of it will be found in a recent number of the *Indian Journal of Medical Research*.

This case is of peculiar interest, for it is clear that the eggs were laid directly on the ulcerated surface and not on the nose, although the patient had a purulent discharge from the nostrils for some time. A nasal discharge often attracts the female *bezziana* to oviposit just inside the nostrils, and the larvæ penetrate into the various sinuses connected with the nose.

Further, it should be noted that, though the larvæ must have been very near the brain tissue, they did not enter the skull. And this emphasizes the fact that the larvæ of *bezziana* do not penetrate bone or cartilage, and that when these structures are destroyed, it does not mean that they have actually eaten their way through them. Their destruction can only be brought about by dissolution through the action of bacterial ferments. All muscid larvæ only feed on fluid food, the substances or tissues on which they are feeding being dissolved by salivary and bacterial ferments.

The patient only noticed the larvæ three days before coming to the hospital for treatment, so that the eggs must have been laid at least ten days earlier. Removal of the larvæ in this case was a comparatively easy matter, as they had not migrated into the nose and antrum.

Current Literature.

Indian Medical Gazette.

Vol. LVI, No. 12, December, 1921.

Arsenical Dermatitis during Treatment with "606." (Major W. L. Harnett, M.B., F.R.C.S., I.M.S.).—The dermatoses constitute one of the most formidable groups of side-effects which may occur in the course of the administration of arsenical preparations in the treatment of syphilis. They appear as a rule towards the end of a course of treatment, heralded by no warning signs or symptoms, and at a period when a considerable amount of arsenic has been administered, the elimination of which it is practically impossible to influence. At the time of the series of cases described by the author the official course of "606" consisted of seven intravenous injections, three doses of 0·3 grm., three of 0·4 grm., and one of 0·5 grm., a total of 2·6 grm., together with eight intramuscular injections of mercury, the whole spread over fifty-seven days. Alternative courses of "914," both intravenous and intramuscular, were laid down, the total dose being 3·9 grm. All cases of syphilis were treated by one of these methods, and it was noted that the course of "606" laid down for the British Army, though easily tolerated by the British soldier, was too intensive for the Indian soldier, who is, on the average, of lighter build and weight, and still more for the drivers, R.A. and followers, individuals of a lower standard of physique. These were treated with "914" which is a drug of lower toxicity.

Bilharzia in Mesopotamia (P. W. Harrison, M.D.).—The author was one of a party which made a trip to the district of Howeiza, in Mesopotamia, in order to study bilharzia infection. The trip only lasted one week and Beni Terrif, the largest town in the district, was made the headquarters. This town proved to be a perfect nest of infection owing to the enormous amount of mud present, caused by the mud flats (used for rice growing) being swamped for four or five months every spring. The children play in the mud, and the younger men, who do the heavy work, are almost constantly in touch with the mud. Over five hundred patients were treated during the week. Inquiry elicited a history of hæmaturia more or less prolonged from almost every adult man interviewed. Women seemed to be less affected. Apparently the disease is essentially an infection of those who are young, and depends for its persistence on perpetual re-infection. In later years, probably because re-infection ceases, as exposure to the heavily infected mud of the town is less, there is a tendency to recover. Treatment consisted of intravenous injections of tartar emetic.

A Case of Bacillus Coli Pericarditis (M. Ganguli, M B.).—The author reports a case admitted to the Medical College Hospital, Calcutta. The patient, a Madrasi, aged 19 years, was suffering from fever varying from 100° F. to 104° F., with occasional cough and præcordial pain of twenty days' duration. On examination on day of admission only an indefinite systolic murmur limited to the apex of the heart was heard. The patient was put on quinine sulph., 15 gr. daily, and had six injections of cinchonidine bihydrochlor., 15 gr. each, but with very little result. Cultural examination of urine showed a growth of *Bacillus coli*. Autogenous vaccine made from the urine was started on the fifteenth day after admission. Patient was discharged ten weeks later without any sign of peri-, endo, or myo-cardial mischief.

INDIAN MEDICAL GAZETTE.

Vol. LVIII, No. 1, January, 1922.

The Rôle of Cattle in the Epidemiology of Malaria (Lt.-Col. Fry, I.M.S.).—The editorial note in the September number of the *Indian Medical Gazette* on the rôle played by cattle in the prevention of malaria refers to a subject which is of the greatest importance in India, where cattle are commonly housed in close association with human dwellings. The author is of the opinion that the vast majority of anopheline mosquitoes never feed on human beings at all. The rate of infection in Bengal, estimated by the dissection of many hundred anophelines, was extraordinarily low, being only 0·2 per cent. This may be explained by the fact that the daytime resting place of anophelines in Bengal is the cowshed, and the mosquitoes dissected were not caught in sleeping rooms, but in cowsheds. Cowhouses are packed with animals at night, and the number of anophelines found in them increases in direct proportion to warmth and darkness. The sleeping apartments of houses in Bengal are kept very clean generally, and though the cowhouses in the same compound may swarm with anophelines, it is exceptional to find a single specimen in a cook-house or sleeping apartment. It is suggested that if the cowhouses were built in a ring on the outskirts of the villages, their inhabitants would be even more free from infestation from mosquitoes than they are at present.

A Choleroid Epidemic in the United Provinces (Lt.-Col. G. A. Sprawson and Capt. J. G. Mukherji).—During the period April 1 to July 11, 1921, the number of cholera cases admitted to King George's Hospital, Lucknow, was about the average. During this time thirty-nine cases were admitted, of whom ten died. Bacteriological reports showed that six of these cases were positive to the cholera vibrio; the rest were negative. As is usual in the Provinces, the incidence of cholera increases in the hot weather, falls suddenly shortly after the onset of the monsoon, and rises again as the monsoon fades away. Between July and August, 1921 (after the monsoon), seventy-five cases of cholera were admitted to the hospital, of whom fifteen died, and there was not one of these cases taken individually that would not, ordinarily from the clinical side, be regarded as true cholera. It was found in hospital and out that the fatal cases were mostly amongst the aged, and small children. Unless attacked by uræmia the adult under treatment usually recovered. It was early noticed that the cases showed less toxicity than those of true cholera. On recovery from the relapse stage there was, except in a few cases, practically no disturbance unless signs of uræmia set in. The temperature chart remained flat. A few cases only showed semi-coma or similar toxic phenomenon. Convalescence seemed even more rapid than in cholera.

Statistics of the Treatment of Cholera Cases by a Modified Method of Sir Leonard Rogers as carried out at the Mayo Hospital (Lal Mohan Chatterjee, M.B.).—All the patients at the Mayo Hospital were treated with a modification of Sir Leonard Rogers's method. Transfusion was done according to the condition of the patients, as directed by Rogers, with certain alterations. At the beginning soda bicarb. solution was used for intravenous injection. This was followed by Rogers's hypertonic solution. The first pint of pure alkaline solution helps the patients with lung trouble; it prevents irritation of the lungs, which sometimes follows a saline injection; it removes acidosis to a certain extent more quickly than the Rogers's hypertonic solution and promotes diuresis.

The medical treatment is followed on the old lines. Fractional doses of calomel check the vomiting quickly, whereas pot. permanganate is often found to increase it.

Kala-azar: A Preliminary Note on the Treatment by the Intramuscular Injection of a Special Preparation of Sodium Antimonyl Tartrate (L. E. Napier, M.R.C.S., L.R.C.P.).—The author gives descriptions of cases treated with a 2 per cent. solution of the scale preparation of sodium antimony tartrate dissolved in distilled water. All injections were given intramuscularly observing the usual aseptic and antiseptic precautions. All the cases treated were successfully cured. The method of giving the injections intramuscularly instead of intravenously is considered to be superior owing to the fact that there are a large number of cases in which it is inadvisable or impossible to give intravenous injections. The intramuscular method of treatment is especially favourable in cases where patients show signs of any marked degree of catarrh of the bronchioles, or who have been previously shown to be liable to lung complications. Also in patients in whom very small doses of intravenous antimony cause violent coughing and vomiting; and patients with feeble pulses and low blood-pressure.

Correspondence.

To the Editor of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—During last year you published some notes of mine on cases of liver abscess treated with emetine only. In the July number of the *Tropical Diseases Bulletin*, Dr. Manson Bahr discredits my diagnosis and doubts my results. I was on leave and missed these comments when they were published, and as a considerable time had elapsed before I saw them I have not hastened to reply.

As regards diagnosis I do not regard aspiration as essential, and as aspiration practically makes operation inevitable, I purposely avoid it and rely, in making a diagnosis, on visual, tactile and mechanical methods of examination. I agree that some cases may be easy to dispute, but my cases seemed to me too obvious to require demonstration by a needle.

Personally I find no more difficulty in believing, when the *causa causans* of a liver abscess has been removed as the amœbæ are by emetine, that the remaining sterile debris can be absorbed, than I have of believing that a gumma disappears when appropriate remedies are given. Dr. Manson Bahr himself, on p. 449 of the 7th edition of Manson's "Tropical Diseases," states that absorption of the contents of an encysted abscess can take place, and if he allows this, why should the absorption of an unencysted abscess be impossible?

It is, of course, well known that there is usually no limiting membrane to a liver abscess, but there is a circulatory attempt to fight and limit the invading organisms, as is shown by the area of hyperæmia surrounding the abscess, while inwards from this limiting zone of hyperæmia lie the amœbæ, and behind them are the debris of the battlefield in all stages of destruction until only the dead products of the fight remain to form the contents of the abscess. So long as the amœbæ are alive and active the direction of circulatory flow is mainly centripetal; but as soon as the amœbæ are killed by emetine the main direction of flow becomes centrifugal, and once this centrifugal flow has set in there is nothing to prevent its continuance, and absorption, in my experience, is a matter of great rapidity. I regard the marked rise of temperature which follows the giving of emetine in a case of hepatic abscess as indicating the death of the amœbæ and the commencement of what I call the centrifugal flow. If absorption is impossible, how otherwise can the rapid and dramatic cures be explained?

My cases have been so successful that I intend to go on in the same way, and I shall hope ultimately to convince Dr. Manson Bahr firstly, that I can recognize a liver abscess even without aspiration, and secondly, that in an uncomplicated case of hepatic abscess emetine is all that is required to obtain a cure.

I am, Sir,
Yours faithfully,
V. S. HODSON.
Director, Khartoum and Omdurman Civil Hospitals.

January 18, 1922.

Experimental Studies of the Naso-pharyngeal Secretions from Influenza Patients (P. K. Olitsky, M.D., and F. L. Gates, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 1, January, 1922).—The authors describe experiments which furnish additional evidence of the pathogenic character and the virtual identity of the various strains of the active agent derived from the naso-pharyngeal secretions of influenzal patients with which the transmission experiments in rabbits have been carried out.

The active material has been shown to be of antigenic nature, so that rabbits are protected from the effects of a second inoculation. The experiments also indicate the antigenic identity of the various strains of the active agent with each other and with *Bacterium pneumosintes*. Finally, the experiments show that the protection may persist for fourteen months, which is the longest period yet tested.

WITH reference to Dr. Salisbury Sharpe's paper on "Diseases of the Ear," published in our issue of February 15, the author inadvertently omitted to state that the paper, though not in its entirety, had been read at a meeting of the Royal Society of Tropical Medicine, held on January 19, 1922.

Original Communications.

AN EARLY CONTRIBUTION TO MEDICAL HELMINTHOLOGY TRANSLATED FROM THE WRITINGS OF THE ARABIAN PHYSICIAN IBN SINA (AVICENNA) WITH A SHORT BIOGRAPHY.

By M. Khalil, M.D., D.P.H., D.T.M. & H.

(From the Helminthological Department, London School of Tropical Medicine.)

In the Oriental library of the British Museum there is a clearly written Arabic manuscript of great interest to Helminthologists. It is a part of the famous medical work of Ibn Sina (Avicenna) called "Al Canon fi Al Tib," i.e., "The Laws of Medicine," and is an encyclopædia of medicine, including anatomy and physiology. The manuscript is a copy of a part of Volume III of the original work and deals with seven subjects numbered 16 to 22. No. 16 deals with Diseases of the Intestine, and comprises five chapters, of which the last deals with Entozoa. No. 17 is on Diseases of the Rectum; No. 18 on Diseases of the Kidneys; No. 19 on the Bladder and Urine; No 20 the Male Genital Organs; No. 21 the Female Genital Organs, containing a section on Child Birth; No. 22 on External Diseases and Affections of the Limbs.

The manuscript consists of 484 pages. There is no index. The title of each subject is written on a fresh line in red ink. The names of the diseases and also the words "signs" and "treatment" are written in red ink but not necessarily on a fresh line. The rest of the text is written in black ink.

The manuscript is dated 525 Hegira (the Mohammedan Era) which corresponds to A.D. 1131. This shows that approximately ninety-four years after the death of the author there was a need for fresh copies of the book.

The following is a nearly literal translation of the last chapter of the section on the diseases of the intestine.

Subject 16.—Chapter V on Worms.

If matter has accumulated and is not a humour it is given a corresponding shape and image, and is not forbidden natural elegance bestowed by the able Creator, and so is which is created as worms and flies and the like originating from fermentable matter. These forms of life arise from fermentation and eat similar fermenting matter, thus taking that matter away from the people and the surrounding air. The intestinal worms resemble these. They are not formed from every mixture. They are not formed from the red or black bitter (? bile) because one is very hot and the other is very cold, thus this does not form the moist worms as it is contradictory in character.

Blood is protected and the need for it by the tissues is very great, corresponding to the heat of man and his greatness, not to worms. Mucus is the matter to form worms. It is warmed and fermented and remains a long time in the intestine. Excess of mucus from food, and dyspepsia and poor digestion due to whatever cause, is well known, e.g., sticky foods such as wheat, beans, uncooked flour, raw meat, milk, moist fruits and vegetables. Bathing with water after eating and coitus on a full stomach.

There are four kinds of worms, "long" (gigantic), "round," "flat" (known as pumpkin seeds) and "small." They are different because of different origin and surrounding. Some are formed from moisture not divided or broken up by attraction of the liver or excess of fermentation. Others are formed from moisture divided or broken up by the attraction of the liver and fermentation, and when formed remain small, and if forced out by weight from a narrow opening. Thirdly, some are formed by an intermediate condition. If in the high gut by the first method, if in the straight gut by the second method, if in the cœcum and the colon by the third method. The long worms originated by the first method and sometimes attain an arm's (forearm) length. The flat and round worms originate from the second although often formed in the high gut, especially if big, and may be found near the cæcum extending in distribution from the stomach to the rectum. The small worms arise from the third method.

The flat and round worms look as if developed from the mucus on the surface of the gut and are always enveloped in a layer of it. The small worms are the least harmful because they are small and far from the "origin." They are always propelled out but if they remain long and multiply may cause great harm. "The long worm" is not as malignant as the flat worm, as it is formed out of more fermentable matter. The flat and the small worms are those which most frequently migrate out of the anus as they are nearer and are weak, unable to fix themselves as firmly as the long worms. If the patient is affected with fever the signs are severe and malignant because the fever destroys the food of the worms which thus move to find food and fix themselves to the wall of the intestine. Moreover the fever also affects the worms.

One observer has reported that he has seen the bowel wall perforated by the worms and this I regard as great. It is possible that the imprisonment of the worms in the gut and the fermentation caused may give rise to fever. It is not beneficial that the worms should feed on fermented matter in the gut because fermentation is either prevented or put right by the secretions. Moreover the fermentation which remains is in greater proportion than the worms, thus preventing the movement of the bowel causing obstruction, &c. Epilepsy, intestinal obstruction, and doglike hunger, may be caused by the consumption of the food by the worms. Bulimia and great palpitation may result. Infancy and growth are the periods in which worms breed the greatest number.

Pumpkin seed worms usually breed on those who have passed infancy. The round worms are more frequent in boyhood and adult life and less in old age, but they occasionally occur at all these ages. They are more common in autumn than at other seasons because fruit is consumed in greater amount then and there is greater fermentation. The symptoms are aggravated in the evenings and at bed time and when the patient is tired with excessive exercise. If worms are passed alive by those affected with acute fever it proves the presence of strength and propulsive power and the fever is not very dangerous; but if the worms are passed dead it is a bad sign. If in the absence of fever the worms are passed in pieces accompanied by blood, this is bad and foretells disease of the body and intestine. If passed in vomited matter, it denotes bad mixtures (secretions) in the stomach.

Clinical Signs.

Common signs are excessive salivation, wet lips at night and a dryness during daytime, because heat is diffused during the day and kept in at night. If heat is diffused, moisture is attracted by it and worms are starved.

The patient continuously moistens his lips, feels oppressed and does not like to talk. He assumes the appearance of anger. This affection may lead to incoherence in speech from the rising of bad vapour. He may have symptoms of "Kranitos" but no headache or buzzing in the ears. Grinding of the teeth especially during night time is a common sign. Patient often appears as if masticating something. During sleep he may be seen muttering or crying, his features change and a sense of tightness in the chest may awaken him. Fainting, pains, aphonia, or weakening of the pulse may occur. When the worms are active he looks as if falling down. The fæces are semi-solid. There is a loss of appetite or there is increased appetite. Patient may suffer from a sense of excessive thirst, not relieved by drinking. If disease is advanced and pain is excessive patient may fall down in convulsions as if epileptic. During these fits he may vomit. Colour of face and eyes may become very pale. A patient may become very swollen with distended abdomen resembling ascites, but due to the abdomen being apparently distended with gas. Scrotum may become

very swollen. There is excessive sweating of unpleasant smell.

Specific Signs.

Some of these signs are shared by all kinds of worms, e.g., the presence of the particular worm in the motion may be detected, or in the vomit.

The "long worm" is characterized by pain in the "mouth" of the stomach, colic, difficulty in swallowing, loss of appetite, and the sight of food makes "the patient" feel ill. The lungs and heart are affected by being adjacent to where the worms are. This causes dry cough, palpitation and irregular pulse. Patient feels sleepy or fresh at irregular periods during day and night. He is lazy, hates activity does not like to strain his eyes and prefers to keep them closed. Occasionally the eyes become red. There may be distension of the abdomen and diarrhœa.

The "broad and round worms" commonly cause excessive appetite because they are farther from the stomach and thus do not catch the food at once. They move with hunger, causing griping below the umbilicus intermittently. This tires the patient very much.

"The small worms" are characterized by itching the buttocks. They may cause fainting and when accumulated, a heaving sensation under the ribs and in the loins.

Treatment.

A good drug for all worms is to drink some vinegar before sleep.

The patient must abstain from eating fermenting food—raw meat and uncooked vegetables and fruits which cause these worms. Disorders in the intestinal secretions must be attended to. The worms must be killed by drugs which are poisonous to them. They must be then expelled by a purge if this is not done naturally. The killed worms ought not to be left long in the intestines as they ferment and become poisonous to the system. The anthelmintic can be administered to the patient in all conditions of health, unless he is suffering from fever or dropsy.

The patient is given milk only, for two days, and then the drug put in milk on the third day. The drug can be given in an enema form and ought to be preceded by an astringent draught by the mouth.

The patient closes his nostrils and breathes as quietly as possible when drinking the anthelmintic draught.

If patient is suffering from diarrhœa at the time, there is no necessity for the purge and sometimes it may be necessary to administer an astringent for fear of collapse.

Anthelmintics poteut to expel flat worms are much stronger than those necessary for long worms. Drugs that expel "flat and round worms" are necessarily effective to expel "long and small worms."

Among many drugs recommended are:—

For "long worms" use seeds of the santoniu tree; cardamom, oats, garlic, which may succeed also in killing "flat worms," colocynth.

For "flat and round worms" use tar, filix mas, aloes, infusion of the leaves of the peach tree, extract of pomegranate peel.

For "small worms" use enemas of salt and warm water, tar enemas.

Patients suffering from worms are recommeuded to take food at short intervals.

Commentary.

There is enough data in this article of Ibn Sina to make a fairly accurate diagnosis of the four kinds of worms recorded by him. The statements that are important in identification are scattered and it is necessary to recapitulate them.

The "long (giganta) worms" are found in high gut (small intestine). They attain an arm's [i.e., forearm] length. They are not as malignant as the "flat worms." They do not migrate out of the anus. They cause loss of appetite, sleepiness, distension of the abdomen and diarrhœa. The seeds of the santonin tree are specifically valuable for expelling them. These worms are apparently *Ascaris lumbricoides.*

The "flat worms" are described as pumpkin seeds. They are often found in the high gut (small intestine) and may be found anywhere between the stomach and the rectum. They cause severe illness, described as malignant. They migrate frequently out of the anus. They are not found during infancy. They produce excessive appetite. They need very potent anthelmintics to expel—more than is necessary to expel Ascaris. Filix mas is mentioned as a specific anthelmintic. These worms are apparently *Tænia*, probably *saginata*, because the Mohammedans do not eat pork in any form.

The "small worms" are often found in the cæcum and the colon. They are the least harmful. They most frequently migrate out of the anus. The symptoms they cause are itching sensation around the buttocks. Enemas and specially common salt in warm water are specific treatment. These worms are apparently *Oxyuris vermicularis.*

The "round worms" are often found in the high gut (small intestine). They are frequent in boyhood and adult life and less in old age. The symptoms are aggravated in the evenings. They are classed with Tænia as causing malignant symptoms. They cause excessive appetite. They are difficult to expel, being placed in the same category as *Tænia saginata.* Filix mas, tar, and aloes are mentioned in the specific treatment. This is apparently *Ankylostoma duodenale.*

The only other nematode of any frequency that may be thought of in connection with the last description is *Trichuris trichiura.* Against this possibility is that the worm is described and named "round" which is not the main character of Trichuris and is not suggested by it. Trichuris is not present in the small intestines. It does not produce malignant symptoms or even any symptoms at all. Moreover it is rarely met with post mortem.

This is probably the earliest valid record of ankylostoma and ankylostomiasis. The clinical features of the disease, together with those caused by the other helminth, contain many interesting observations. He rightly recorded the multiplicity of symptoms caused. Even such rare occurrences as intestinal obstruction and perforation of the bowel are mentioned. Flatulence, anasarca, epileptiform attacks and palpitation are repeated more than once.

In connection with ascaris he specially emphasized lung and heart symptoms, dry cough, palpitation, and irregular pulse, but it is doubtful if these were realized as early symptoms, as we know now to be associated with the wanderings of the larvæ as recently discovered.

The rationale upon which the treatment advocated is based holds good till to-day. It is clearly stated with the indication and contra-indication of each step. It is not clearly mentioned that these are based on his original observations or copied from others but in either case the credit of their record is due to him. The list of drugs used is voluminous but I am not able to translate them except in the

case of the few mentioned here. It is clear, however, that he advocated the seeds of the santonin tree for ascaris; Filix mas for tænia and hookworm, and common salt enema for oxyuris, all of which hold good to the present time.

It is apparent from the fact that he recorded the common seats of infection of each worm that he had occasion to examine the gut post mortem.

Biographical Note on Ibn Sina.

(*Extracted from* the Book of "Biographies of the Notables," written by Ibn Khillikan, the historian).

Ibn Sina was born in the year 370 Hegira (981 A.D.) and died in the year 428 Hegira (1037 A.D.) at Hamazan and, according to some historians, at Asbihan (both towns in Persia). His full name was Abu Ali El Housien Ibn Abdallah Ibn Sina. He was titled as the "Chief Sheikh" (the head of the profession). His father was a native of Balakh and went to Boukhara where Ibn Sina was born (both towns in Turkestan). When Ibn Sina was ten years of age he learnt the Koran (the sacred book of the Mohammedans); literature, arithmetic, geometry, and algebra. His father was visited by a doctor, Abu Abdallah El Naelly, who began to teach Ibn Sina, Isaghogy (the name of a book), logic, Euclid and magisty. Ibn Sina showed great brilliancy, surpassing his teacher, he differed with him in opinion in many discussions and he was always right.

He also attended Ismail El Zahid, learning religion and discussion.

When his medical teacher left, he continued his studies of knowledge, both natural and religious. At last he felt special inclination towards medicine. He read all the books he could on the subject. He treated patients, not for the sake of money, and soon became superior to the past and present members of the profession. He was visited by the eminent doctors of all countries to learn treatment as found by experience. At that time he was 16 years old.

During his studies he never slept a complete night, and spent his daytime in study only. When he had any difficulty he used to visit the mosque and pray.

Amir Mohamed Ibn Nasr El Samani, of Kharasan, asked Ibn Sina to come and treat him during his illness. He was cured and thus Ibn Sina became attached to him and was able to study in his library which contained many rare manuscripts. After a long time this library was burnt and it was said that Ibn Sina caused the fire, to be the only one having the knowledge of what was in it. He was then 18 years old. He visited many places and became prime minister to Shams El Dawlah whom he treated later for intestinal obstruction.

Ibn Sina had a strong will and was given to sexual excess which caused him to be emaciated. He suffered from intestinal obstruction and administered to himself eight enemas in one day. Afterwards he was occasionally ill and the obstruction recurred. He did not treat himself this time, saying, "If the agent in my body is unable to put it right treatment is of no avail." He gave money to the poor and set free his slaves and sat reading the Koran till he died.

He was a rarity in his age for his alertness and works. He wrote nearly 100 books varying in size. Some of these books deal with literature. He was a Mohammedan philosopher and poet. In some of his poetry he described human life.

ON THE SUSCEPTIBILITY OF THE EGG MASSES OF PLANORBIS TO DRYING, CHEMICAL FERTILIZERS, &c., AND ITS BEARING ON THE CONTROL OF BILHARZIA DISEASE

By M. Khalil, M.D., D.P.H., D.T.M.
(*From the Helminthological Department of the London School of Tropical Medicine.*)

The experiments detailed in this paper were performed in connection with the suggestion of eradicating bilharziasis by destruction of the snail intermediate host advocated by Leiper. The conditions in Egypt are favourable for the application of dryness to destroy the snails. The water is under strict control and any particular irrigation canal can be dried by stopping its supply. During the summer months these canals are supplied with water one week and kept dry almost three weeks in rotation. It was during the end of the period of dryness that Leiper observed that most of the snails were dead in the dry beds of the canals.

There was a possibility that the eggs laid by the snails might be able to resist the dry period and reinfest the canals when refilled. To settle this question it was necessary to test the effect of dryness on the eggs. At that time, it was not possible to get the particular snail intermediate hosts from Egypt for experiment. Even if this had been possible the results would not have been conclusive because of the different atmospheric surroundings in England to their normal habitat in Egypt.

It was decided to work with *Planorbis corneus* collected from the ponds on Hampstead Heath. This is much bigger in size, but is similar to *Planorbis boissyi* of Egypt in its habits and in the type of localities favourable for breeding. The experiments were carried on during the months of July and August. This is the usual time of the year for laying eggs. It was possible to keep twenty-seven separate experiments under observation daily for a period of one week to three weeks. Controls were kept in every case.

Planorbis corneus lays its eggs in a jelly-like mass, yellowish in colour. When freshly laid the mass is sticky and adheres firmly to the surface on which it is laid. This is commonly the shells of other snails, the leaves of plants growing in the water, or the walls of the vessel in which the snails are kept. Inside the gelatinous mass, the eggs lie side by side, never superimposed one on the other. After a few hours the surface of the gelatinous mass is hard enough to allow it to be lifted entire by gentle manipulation. It is then irregularly oval and varies in size according to the number of the eggs contained. It is commonly

1·5 cm. long by 1 cm. broad and 2 mm. thick. The number of eggs contained in each mass varies between thirty-five and forty-eight. The gelatinous mass is heavier than water and readily sinks to the bottom. If its surface is injured air bubbles are seen to enter between its two layers and in this condition it floats.

The eggs are visible to the naked eye. They are clear and oval, orange in colour, with a small opaque mass in the centre. They measure 1·43 mm. in length and 1·25 mm in breadth. The opaque and rounded mass is the ovum, while the clear surrounding protoplasm contains the reserve food material. The ovum is 0·18 mm. in diameter. Few eggs are sometimes seen with no ovum and these necessarily do not develop. They have a paler colour.

Development.

The division of the ovum in development can be watched from day to day under the microscope. After twenty-four hours the ovum divides into two. After forty-eight hours it divides into four. By the third day the morula consists of twelve segments measuring 0·26 mm. in diameter. On the fourth day about twenty segments can be seen. On the fifth day it cannot be counted, having a spherical form 0·35 mm. in diameter, which is now actively moving in the substance of the egg. By the end of the first week the active mass is 0·85 mm. in diameter.

On the ninth day the shell begins to form, and a red globular mass quite separate from the embryo appears in the egg. It may probably represent the excretion of the embryo. The shell continues to grow. By the twelfth day the first spiral of the shell is definitely seen, and the embryo is 1·07 mm. in diameter, nearly filling the egg. The eggs hatch on about the fifteenth day. This period in six different observations varied between fourteen and seventeen days. The hatched snail is 1·25 mm. in diameter. It is then able to attach itself to objects, and slide along the wall of the vessel.

TECHNIQUE.

The egg masses were collected daily in a separate glass tube, $1\frac{1}{2}$ in. by 4 in., containing 2 in. deep of tap water. This was duly labelled and dated. At definite dates one or more of the egg masses were taken out and put on a clean glass slide and left to dry in the shade. The time was recorded, and observations as to their condition were made and noted at intervals. The temperature of the room during the period of observation fluctuated between 62° and 72° F. as recorded daily by a maximum and minimum thermometer. The dry mass of eggs was then placed in another glass tube containing water, and examined daily. The original bottle was kept as a control. All the controls developed naturally and hatched.

In trying the effect of chemicals, a solution of the strength required was prepared, and one or more masses of eggs were dropped in it for the required time. They were then washed in tap water and placed in a clean glass tube containing fresh water and observed daily.

Experiments on the effect of dryness and chemicals on adult snails were carried out on a similar line.

Effect of Dryness on the Eggs.

The effect of dryness on the eggs is not influenced by the stage of development of the embryo. The time necessary to kill newly laid eggs is the same as for eggs that have been developing one or several days.

Egg masses were subjected to dryness for periods varying between four hours and five days. Five hours was found to be the minimum time of dryness that killed the eggs. In ten experiments in which the eggs were dry for more than five hours, only in two eggs out of the large number used were there signs of reviving when returned to water, but this was only for a short time. They soon died and in no case did any egg hatch. In these particular instances the egg masses were dried for five and ten hours respectively.

After four hours of dryness all movement of the embryo stops. A crease encircling the egg appears after twenty hours and soon after, another crease, at right angles to the first, appears. The clear protoplasm becomes granular. When put in water the superficial creases disappear but the protoplasm becomes more granular, and later it is detached from the egg wall and disintegrated into fragments.

Eggs subjected to dryness for less than five hours revive in twenty-four hours after being placed in water. Their development, however, is retarded and, on an average, they take nineteen days to hatch.

Effect of Ammonium Sulphate Fertilizer.

The crude fertilizer was used. It was thought advantageous to try its effect as it was found to be cheaper and is used by agriculturists for the cultivated land.

The effect of this fertilizer is not modified by the stage of development of the eggs if the strength of the solution and the time of application are the same. All the egg masses exposed to the effect of $\frac{1}{1000}$ dilution of the crude ammonium sulphate fertilizer for more than six hours were killed without exception. The active embryos stopped motion after two hours immersion. When transferred to fresh water after more than six hours the eggs become granular and disintegrate rapidly. $\frac{1}{5000}$ dilution kills the eggs when they are exposed for more than twenty hours.

Egg masses exposed to $\frac{1}{1000}$ crude ammonium sulphate for three hours recover when put in fresh water and their hatching is retarded but not to the same extent as in the case of drying.

The Adult Snails.

Dryness was tried precisely in the same manner as in the case of the egg masses. *Limnea peregra* did not survive two days' dryness. *Planorbis corneus* survived two days but was killed by three days' dryness. This is in general agreement with Leiper's observation in Egypt that Planorbis resists dryness more than Bullinus or Limnea.

Twenty-four hours' immersion in $\frac{1}{1000}$ ammonium sulphate fertilizer proved to be fatal to Planorbis.

Conclusions.

Dryness is a potent agent in killing Planorbis and its eggs. The eggs are less resistant than the adults. Their gelatinous capsule offers very little protection. In a country like Egypt the atmospheric temperature is high, to which is added the potent effect of the direct rays of the sun. Even when the egg masses are protected by the shade of vegetation, dryness will still be effective to kill both the snails and their eggs.

Probably the method of drying is applicable only in Egypt on a large scale, as in few other countries is the water supply under such strict Government control. Where owing to irregularities in the beds of the canals small puddles enable some of the snails to keep alive during dryness, these can be treated with ammonium sulphate or copper sulphate, which was alluded to in a previous paper. From the utilization of these measures there should be a good prospect for the control of Bilharziasis in Egypt.

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PULMONARY TUBERCULOSIS AS A PROBLEM OF TROPICAL MEDICINE.

By W. M. McDonald.

M.O. District No. 2 and M.O.H. Antigua, B.W.I.

Pulmonary tuberculosis is not a tropical disease, and for this reason we do not as a rule find any discussion of this disease in books devoted to tropical diseases. This is unfortunate, first, because the incidence of, and the death-rate from, this disease is unduly high in the tropics; secondly, because the early diagnosis of this disease is more difficult, as well as more necessary, in the tropics —more difficult, because the early symptoms may be so easily obscured by or confused with certain tropical diseases, and more necessary, because in parts of the tropics, such as the West Indies, we have climatic conditions which, properly utilized, should render the prognosis in any case of pulmonary tuberculosis, which is diagnosed sufficiently early, much more hopeful than it would be in a colder and less equable climate.

At the recent West Indian Medical Conference the incidence of pulmonary tuberculosis was not touched upon, except in a general statement to the effect that there is very little pulmonary tuberculosis in Grenada, but that this disease is common in Barbados.

As a matter of fact, pulmonary tuberculosis is one of the chief causes of death throughout the West Indies, and in many islands it is the cause of more deaths per annum than any other single disease.

The death-rate per 1,000 of population from pulmonary tuberculosis is roughly: In Demerara, 1·7 for the Colony and 3·2 for Georgetown; in Trinidad, 1·7 for the Colony and 3·5 for Port-of-Spain; in Antigua, 1·5.

In most of the islands no steps are taken to combat this disease. In others, such as Trinidad and Demerara, there exist societies for the prevention and treatment of pulmonary tuberculosis. In Demerara and in Grenada there are special hospitals. From the point of view of prevention of infection these societies do excellent work. The hospitals, too, serve their purpose in providing isolation for patients and comforts for the dying, but their utility is greatly reduced by the fact that they do not as a rule obtain patients at the stage in which the disease is capable of cure or of arrest.

From the point of view of treatment with a view to possible cure or arrest of the disease, none of the measures in force strike at the root of the matter, which is early diagnosis. The only method of attacking the disease which affords any reasonable hope of success from the patient's point of view lies in early diagnosis.

In pulmonary tuberculosis the patient's chances of recovery or of partial recovery are in direct ratio to the stage at which the disease is diagnosed and treated. Roughly, one may state that, given appropriate treatment—in cases diagnosed in the incipient stage, recovery is possible and probable—in cases diagnosed in the second stage arrest is possible but not probable, and that cases which are not diagnosed until the third stage is reached have no chance of recovery.

Such a classification is necessarily not exact, because the prognosis in pulmonary tuberculosis must be dependent to a certain extent on other factors, such as, associated morbid conditions and the degree of resistance and recuperative power which is possessed by the patient, but broadly speaking such a classification should hold good.

Before proceeding to any further discussion it is necessary to classify roughly the three stages of the disease. The incipient stage may be considered as that in which the physical signs of the disease are limited to one lobe, the clinical signs are slight and unobtrusive, and the general resisting power of the patient has not yet been seriously impaired; the second stage is that in which consolidation is advanced but is limited to one lung, and the clinical signs are definite; the third stage is that in which cavities have been formed, both lungs are affected, and the clinical signs are obtrusive and unmistakeable.

The first and most important step, therefore, of administrative control of the disease should be the provision of facilities for early diagnosis by the establishment in each island of a tuberculosis clinic, at which clinical and bacteriological examinations should be given free of cost to any person who may wish for such examination. Cases could be sent up for examinations by the district medical officers or the district nurses, or may come in of their own accord. Such a clinic should also be a centre for

propaganda. Pamphlets embodying the essential principles of treatment could be distributed, and many patients could be treated in their own homes under the direction of their private medical attendant. Persons who had been exposed to infection could be encouraged to attend for examination with a view to detecting the disease in its earliest stage.

The most important point of medical control of the disease also lies in early diagnosis. In this connection it must be observed that pulmonary tuberculosis as a problem of tropical medicine has not hitherto received the attention which it deserves. The student of tropical medicine receives special instruction in the diagnosis of malaria, filariasis, yellow fever, and other strictly tropical diseases, but he receives no special instruction in the diagnosis of incipient pulmonary tuberculosis, and his attention is at no time specially directed to the study of this disease.

Now, in general practice, there is no problem more difficult than the diagnosis of incipient pulmonary tuberculosis. In the tropics the difficulties of diagnosis are intensified by the prevalence of many tropical diseases which tend to obscure the initial symptoms of pulmonary tuberculosis. This is especially true in the case of fever.

Fever is one of the most valuable indications of the presence and progress of pulmonary tuberculosis. In a temperate or cold climate, if a patient consults us because of a regular afternoon or evening temperature, we at once suspect tubercle, and we make a careful investigation for other confirmatory symptoms. If, on the other hand, a patient consults us because of general ill-health, the symptoms of which are vague or only slightly suggestive of pulmonary tuberculosis, we obtain a four-hourly record of his temperature with a view to strengthening or weakening our suspicions.

In the tropics, on the contrary, if a patient consults us because of an afternoon or evening rise of temperature we at once suspect malaria, and we make no investigation for the unobtrusive signs of early tuberculosis. If, on the other hand, a patient consults us because of general ill-health we suspect malaria; we take his temperature and, finding it raised, we regard this as confirmatory. In nineteen out of twenty cases we are right, but in the twentieth case we may be wrong, and this is just the case in which a correct diagnosis is a matter of life or death to the patient. We are quite right in regarding malaria as the probable cause of fever in such cases, but it is very necessary for us always to bear in mind the possibility and the suspicion that the case may be incipient pulmonary tuberculosis.

It has been said that many cases of pulmonary tuberculosis in the West Indies date from an attack of malaria; but it is more than possible that many cases of pulmonary tuberculosis in the West Indies are treated as malaria while in the early stages, greatly to the detriment of the patient.

Another important factor which tends to obscure the diagnosis of incipient tuberculosis is, that in the tropics cough is not an obtrusive symptom in the early stage. The patient may deny absolutely that he suffers from cough, but careful inquiry may reveal the fact that he usually needs to "clear his throat" in the early morning, or after running upstairs. A slight cough of that nature in the tropics is a danger signal, and should be clearly recognized as such. In this connection it cannot be too strongly represented that the patient who waits for the development of a pronounced cough before consulting a doctor is throwing away his best chance of recovery, and that the doctor who waits for the development of a pronounced cough before suspecting and investigating for pulmonary tuberculosis is allowing his patient to slip through his fingers.

When we begin to realize that low fever and absence of cough may be common symptoms of malaria and pulmonary tuberculosis, we can see how fatally easy it is, in a country where malaria is rampant, to make a wrong diagnosis with disastrous results to the patient.

In investigating a case presenting the above symptoms, no pains should be spared in making a differential diagnosis. We must bear in mind always that it is just when we feel sure that the case is obviously malaria that we are most likely to omit investigation for possible pulmonary tuberculosis.

Bacteriological examinations of sputum for tubercle and of blood for malarial parasites should always be undertaken, but we should always bear in mind in connection with such examinations that while positive results are of immense value, yet that a negative sputum report is of no value whatever, and that a negative blood report is of very little value unless we make repeated examinations.

When blood and sputum examinations are both negative, valuable indications can be gained from the general blood picture and differential count, which is essentially different in these two diseases. Particular attention should be paid to the Arneth count, which is high in pulmonary tuberculosis and low in malaria.

Another point of difference between these two diseases is the pulse-rate, which is increased in pulmonary tuberculosis and normal in chronic malaria, which is the type of malaria under discussion. An acute attack of malaria will be accompanied by an increased pulse-rate, but the symptoms in such a case are not likely to be confused with those of pulmonary tuberculosis.

Other points the investigation of which may help us to make a differential diagnosis are:—

(*a*) Family history.

(*b*) Previous history of pleurisy.

(*c*) Dyspeptic symptoms.

(Many cases of pulmonary tuberculosis begin with symptoms of indigestion and retching.)

Granted an early diagnosis, the prognosis of any case of pulmonary tuberculosis which is correctly treated is infinitely better in the West Indian climate than it is in the English climate. We have in many of these islands an equable temperature, dry atmosphere, and abundance of sunshine—

absolutely ideal conditions for the treatment of pulmonary tuberculosis. Here the patient can have unlimited fresh air and sunshine without any risk of chill.

The question of treatment of pulmonary tuberculosis is outside the scope of this paper, but there is one very important point which needs particular emphasis—that is, that we shall never get the best results, or even good results from treatment, until the fallacy that fresh air is a cure for pulmonary tuberculosis is exploded. Fresh air is *not* a cure for pulmonary tuberculosis; it is only a factor of cure, and not the most important factor either. Our cemeteries are full of tuberculosis patients who have ridden on horseback, or driven in carriages, or motors, or have in some like manner rushed, or have been rushed, to their death in the open air.

For the possible cure of pulmonary tuberculosis there are three great essentials: Rest, fresh air, and diet, and the greatest of these is rest.

An oppositionist may tell you, as one told me recently, that this talk of rest is all rubbish, for he visited a tuberculosis sanatorium and saw some of the patients chopping wood. That may be so. In time the patient who has been properly treated may arrive at a stage in which he may be allowed graduated exercise, under the directions of a doctor, but it is quite certain that the patient who does not go through this period of absolute rest will never arrive at the stage at which he can chop wood without thereby sounding his death-knell.

The onset of pulmonary tuberculosis may be likened to the lighting of a fire. The fire once lit, exertion is the fan which spreads the flame; rest is the water which quenches it. Our only hope of conquering the "fire" is to detect it and try to quench it before it assumes uncontrollable dimensions.

With this end in view the public should be educated to realize the insidious nature of the onset of pulmonary tuberculosis. The Governments should provide facilities and encouragement for the early diagnosis, treatment, and prevention of this disease, and pulmonary tuberculosis should be included in that group of diseases to which the student of tropical medicine is invited to direct special attention. By such means we may hope not only to lessen the incidence of pulmonary tuberculosis in the tropics, but also to increase the percentage of cures among those attacked.

A Blood-sucking Fly from Cuba (W. H. Hoffmann, *American Journal of Tropical Medicine*, September, 1921).—The author records observations made on a blood-sucking fly which continually attacked him during the cold and dry season (November to March) while staying in Havana. It will bite at all times of the day and nearly always attacks the head. The fly was unknown to the residents, but has been identified as *Chrysops costata*, F.

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Tropical Medicine and Hygiene

MARCH 15, 1922.

NATIONALITY AND DISEASE.

NATIONALITY is a hindrance to humanity; being a hindrance it is therefore detrimental; being detrimental it ought to be abolished; a syllogism which brings about a Q.E.D. These are the declared opinions of many "reasoners," and there with *them* the matter ends. Plenty such reasoners exist; they are met with in the coffee shops and

amongst the domino players of the European slums. But the man with ambition, in a corner seat, cloaked in revolutionary garb, with the furtive look and the shuffling gait, cultivates their acquaintance, and by secret literature binds them into an undercurrent of discontent, disbelief, disruption and destruction. These are the points against nationality; and on such points and by such reasoners are the principles on which nationality is condemned upheld. For these in medicine we have no use, our complaint is of a milder nature; it is that nationality tends to harm the combination of talents to fight disease, that the warfare is frustrated by an imaginary line of national limitation across which we may not legally go. We are afflicted by a scourge, by an epidemic, an infectious ailment which is causing widespread destruction on both sides of the boundary line of the river or the sea on opposite banks or shores, be the river wide or narrow, be the shores adjacent or thousands of miles apart. Seas and rivers are, however, but means of ready communion, and man and beast and insect pass to and fro, bringing commerce *and* disease in their boats and ships. Adjacent countries may each and all be doing their utmost to check the inroad and spread of the scourge, each may be handling it scientifically and successfully, but there may be no official communication as to what each is doing until the formal reports are printed and published in the usual Governmental statements available for reading it may be in a year hence.

It is but little use of one country giving wholehearted attention to the eradication of a disease, if at the boundary the work cannot be extended, but must stop at a point where the nation may end, but across which the disease knows no such limitation. On the map each country has a separate colour, one blue and another red, and the legislative powers of each meet. The neutral zone between each may deal with custom regulations, but nothing can be done in the way of barriers to disease; as soon attempt to keep back, say, the wind by a five-barred gate as cholera or malaria, or to attempt to prevent insect-borne disease by anything short of a revolution in our—disease epidemic —legislation as it exists to-day. And why not a revolution? Oh! we have had enough of revolution, and the word has an ugly sound and a forbidding echo. The language barrier is another stumbling-block to that "union of hearts" which one should find when dealing with disease on our borders. The neighbouring practitioners, moreover, on the borders belonging to separate legislation due to nationality are seldom permitted to state to what extent disease is present, or it may be the sanitary authorities are commanded to deny all knowledge of any infectious disease being present. When a few cases of cholera or plague are discovered in a sea port, the damage done to commerce by letting it be blazed abroad as it may be so harmful as to bring ruin to merchants and to the labourers dependent upon it; it is safer to abuse the doctor who tells tales. The writer, when he told two important men in 1894 that plague had spread from Canton to Hong-Kong, was in that predicament, and instead of attempting to mitigate the inroad of the disease, they and their friends tried to mask the harbinger of bad news and his report.

Another factor which also must be mentioned is that of "national" jealousy which may even extend to doctors in their professional capacity. Science is said to have no boundary and know no nationality. Between doctors there may be none, but the moment official procedure comes in then a different story is to hand. The doctors are not at liberty to disclose official secrets, amongst which are included diseases, their prevalence and histories, and tho bearing they have on "politics."

These are the difficulties or some of them. How about the cure? How in the name of humanity can this branch of national detraction be overcome? It may be said such international questions are dealt with by the Diplomatic or Consular service. We are aware, but that takes time, and time means deferred opportunity and loss of the critical moment. Alliances are in the air, and can there not be arranged a scientific alliance, a medical entente, with practical opidemiological intent, ready for consultations at speedy notice between the medical men and sanitarians of neighbouring countries, not a few months hence, nor at a few weeks' summons, but at hourly calls if such are possible? Two adjacent countries may know nothing of what is being done in the nearest district of another country which is separate only by their boundary *line*. Even in our own Empire the Government of two adjacent colonies between which a track, a road, a river, a village intervenes, because they are each under separate legislation may know nothing of what is going on a few hundred yards from their boundaries until the annual report for the following year is printed and published and circulated. The two colonies may find that different lines of sanitation have been pursued, different treatment adopted, and that infected persons are being driven across the borders of one to find shelter in the other, and the carriage of disease by human beings or animals to the other. The Rhodesian authorities may hear nothing of the dangers they run from their neighbours, or vice versa, until the official reports of each are available many months later. Plague and its rat-carrier may have been driven over the boundary to other lands and other legislatures, and no warning communication forwarded. Some may believe in the efficacy of burning out a plague-struck village as a good step in sanitation. It may be satisfactory to the village or district which adopts the method, but is detrimental to the country into which the rats have been driven from their runs. Trypanosome-infected people may be allowed to go to and fro, and to places where no infection has been hitherto reported. Infections amongst natives may be found in parts of a country

which have not hitherto been suspected and well away from the usual channels of communication. The examples need not be multiplied, and none know the trials and difficulties such "border" troubles bring about than those on the spot, and the great source of dauger by the absence of such "friendly talks" with the medical men of other countries and other Governments on the borderland straight away.

If the difficulty is with languages, care should be taken that only those who can speak the language of their neighbours should be apportioned to the posts in question, be the speech of their neighbours a European, an Indian, or an African language or dialect.

A world-wide entente, alliance, or understanding amongst sanitary and medical officers of all countries dealing with epidemiology must see the light-of-day founded on common sense and common humanity as distinct from long time delayed publications if we hope ever to tackle epidemic ailments and reduce the chances of infection to a lower basis.

Annotations.

The Reliability of Gate and Papacostas's Formol-gel Test for Syphilis as compared with the Wassermann Reaction (S. Ramakrishnan, *Indian Journal of Medical Research*, vol. ix, No. 3, January, 1922).—Gate and Papacostas's formol-gel reaction has been tested with the sera of 539 cases sent for the diagnosis of syphilis against the Wassermann reaction, and the two tests have been found to agree in only 66·6 per cent. of cases.

In the sera which have deviated 8 M.H.D. of complement, and which presumably came from well-marked cases of the disease, the percentage of agreement was only 73·4 per cent.

The test cannot therefore be considered sufficiently reliable to take the place of the Wassermann reaction.

Diabetes Mellitus (P. L. Marsh, M.D., L. H. Newburgh, M.D., and L. E. Holly, M.D., *Archives of Internal Medicine*, vol. xxix, No. 1, January, 1922).—Nitrogen balance can be established in the diabetic according to the laws applicable to the normal subject, provided his total caloric requirement can be satisfied. This implies that he can burn enough glucose to metabolize fat. Diabetics who cannot burn this small amount of glucose are extremely rare.

Protein metabolism above the minimal is undesirable in the diabetic because of (*a*) the great glycogenic property, and (*b*) the large specific dynamic action of protein. Excessive protein metabolism results from a diet containing either too much protein or too few total calories.

Treatment of Affections of the Lung with Phosphate of Creosote (Djismedjian, the *Practitioner*, vol. cviii, No. 1, January, 1922).—The author deals very fully with the drawbacks and advantages of the treatment of bronchial and pulmonary affections with creosote, showing the advantage to be gained by using the ethers and polyethers of creosote in place of the creosote itself, these being less caustic and toxic. The best of these derivatives is phosote, or phosphate of creosote, it is easy to use, well tolerated, and quite innocuous. Its physiological and therapeutic properties are the same as creosote, and it has the same bactericidal effect. The best method of administration is by gelatine *perles*, each containing 0·25 gr. of the preparation, five of which form the average daily dose.

Notes on Ulcerative Granuloma (P. A. Maplestone, *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 4, December, 1921).—The author describes briefly four cases of ulcerative granuloma, lesions occurring in the first case on the penis, in the second on the lip, and the two last on the vulva, the first patient being a male. Treatment consisted of the application of a simple, non-irritant, antiseptic dressing to the lesions and intravenous injections of tartar emetic 1 gr. in 10 c.c. of normal saline twice weekly. Improvement was observed after the first or second injection, and healing continued without signs of relapse during the course of the treatment. On account of the tendency of the disease to recur, five or six injections were given after the ulcer had quite healed.

Operations against Yellow Fever (Seventh Annual Report of the Rockefeller International Health Building).—Co-operative work was commenced in 1920 against yellow fever in every region in America in which it was known to exist. In Central America and Mexico control measures were carried out throughout the infected areas, provision was made for a special yellow fever commission, and £5,000 was set aside for the work, with the result that during the last six months of the year yellow fever in Mexico was checked, and in July, 1920, it was officially announced that yellow fever was entirely eradicated from Ecuador, Guayaquil, and other parts, while protective measures were successfully carried out in Peru and Brazil.

The Trypanocidal Effect of Phenylglycine-amido-arsenate of Sodium on Trypanosoma brucei in Rats and T. rhodesiense in Mice (S. Adler, M.B., *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 4, December, 1921).—Phenylglycine - amido - arsenate of sodium can be used in freshly prepared solutions in distilled water for intraperitoneal injection into

rats and mice; the solutions on standing become toxic, and later become yellow in colour. For rats, the minimum lethal dose of the freshly prepared drug proved to be 1·2 grm. per kilo. of body-weight. For rats infected with *Trypanosoma brucei*, the minimum curative dose is 0·7 grm. per kilo. of body-weight.

In vitro the drug has no appreciable action on trypanosomes, nor has the blood of treated animals immediately (twenty-four hours) after become trypanosome-free. The drug has no curative effect on mice infected with *T. rhodesiense*.

A remarkable feature of this drug is its relatively high minimum lethal dose. Although the drug contains 26 per cent. arsenic, the minimum lethal dose was found to be 1·2 grm. per kilo. for rats and 3 grm. for mice.

The Effect of Saline Solutions and Sea-water on Stegomyia fasciata (J. W. S. Macfie, *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 4, December, 1921).—The result of the author's experiments is that a 1·0 to 1·4 per cent. solution of common salt, or an equivalent strength of sea-wafer, would effectually prevent the larvæ of *Stegomyia fasciata* from developing to the adult stage. It seems probable that sea-water, if used for such purposes as flushing drains and gutters, scouring market-places, &c., would kill both the larvæ and the eggs of this mosquito, and that even if puddles were left the adult females would be reluctant to deposit their eggs on them, but that if they did so the eggs would be killed immediately.

Flies in Papua (W. M. Strong, *Medical Journal of Australia*, September, 1921).—The author records a species of flies greatly resembling *Phlebotomus pappatasii* in Papua. It may probably occur in tropical Australia, too, and is thought to be the transmitter of three-day fever. The author describes the difference between it and *P. pappatasii*.

Blood Fat in Diabetes (N. R. Blatherwick, *Journal of Biological Chemistry*, Baltimore, November, 1921).—The author has made a study of the relation of blood fat to fat in diet, and is of the opinion that the constancy of the blood fat level and absence of acetone bodies in the urine indicate the ability of mild and moderate diabetes to utilize large amounts of fat satisfactorily.

Capillary Poisons and Acidosis (G. B. Wallace, M.D., and E. J. Pellini, M.D., *Archives of Internal Medicine*, vol. xxviii, No. 6, December, 1921).—Those poisons which have a widespread action on capillaries produce a marked degree of acidosis. Among these are diphtheria toxin, uranium and cantharidin. Renal injury is not an essential factor in the acidosis, since double nephrectomy fails to produce acidosis, and this condition can be brought about in nephrectomized animals.

Those poisons which act selectively on the intestinal capillaries fail to produce acidosis, or if so, produce it to a minor degree. Marked injury to liver tissue does not cause acidosis. Evidence is submitted which points to muscle tissue as being one of the seats of acid formation.

The assumption is made that the cause of acidosis is a condition showing suboxidation in the tissues, and experiments are reported showing that suboxidation produced by other means than capillary poisoning also causes acidosis. Capillary poisoning is suggested as an explanation of acidosis occurring in acute infectious diseases and some other clinical conditions.

A Study of the Urea Concentration Test for Kidney Function (I. M. Rabinowitch, M.D., *Archives of Internal Medicine*, vol. xxviii, No. 6, December, 1921).—There is no single test for kidney function, which, in the author's opinion, could be used for the purpose of renal diagnosis, to exclusion of all others. Various types of nephritis show varied responses to each test. The information obtained from the simple nocturnal urine test parallels that obtained from the urea concentration test. Both the "urea concentration test" and nocturnal urine test give only qualitative information.

To properly interpret the results of any test, a correlation with the clinical picture is of paramount importance.

Observations on Glycæmia, Glycuresis and Water Excretion in Obesity (C. Beeler, B.S., and R. Fitz, M.D., *Archives of Internal Medicine*, vol. xxviii, No. 6, December, 1921).—Obese patients show characteristic changes in sugar and water metabolism which may be important in subsequent treatment. Certain patients show a relatively normal curve of glycæmia following the ingestion of 100 grm. glucose. These patients tend to excrete small volumes of urine and small quantities of sugar. They do not appear to retain sugar because of an impermeable kidney, but rather to have some disturbance in sugar and water metabolism which may be related to an endocrinopathy. It seems possible that these patients burn or store sugar with unusual rapidity, a reaction which may be a factor in the development of adiposity. They probably are not likely to develop subsequent diabetes, and should be treated for obesity and endocrine disease, if the existence is demonstrable.

A sugar tolerance test in obese patients, which includes a blood sugar curve and quantitative measurement of sugar and fluid output, affords valuable diagnostic and therapeutic information.

Experimental Diabetes Insipidus (P. Bailey and F. Bremer, *Archives of Internal Medicine*, vol. xxviii, No. 6, December, 1921).—The intimate mechanism of diabetes insipidus is unknown. It is provoked with certainty by a lesion of the postinfundibular region of the hypothalamus. There is evidence that such a lesion produces both polydipsia and polyuria, and the polydipsia may precede. Experimental diabetes insipidus persists after denervation of the kidney, and cannot, therefore, be attributed to a disturbance of its nervous or vasomotor regulation. We have no evidence of any hormone regulating the kidney, especially a pituitary hormone. The kidney conserves its ability to concentrate. All these facts point to an extrarenal factor as the essence of diabetes insipidus, and it is certainly not a coincidence that this condition is accompanied both in clinical and experimental cases by other metabolic disturbances.

Subcutaneous Fibroid Syphilomas of Elbows and Knees (Howard Fox, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 2, February, 1922).—A rare manifestation of late syphilis is described in the case of a negress, aged 45. Undoubted evidence of syphilis was shown by a circinate group of nodules on one arm and the + + + + Wassermann reaction. On both elbows and knees were extremely hard, painless, subcutaneous nodules, which had appeared two years previously and remained unchanged during that time. They had no apparent relation to the bursæ. A histological examination of one of the lesions showed a dense fibrous gumma. Two other similar cases from the literature are quoted. The similarity of juxta-articular nodules is discussed.

The Diagnosis of Some Eruptions on the Hands and Feet (Charles M. Williams, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 2, February, 1922).—There is a well-defined group of eruptions occurring on the feet, often as a complication of tinea cruris, in which a mycotic organism can usually be demonstrated, and this organism is often *Epidermophyton cruris* Castellani. There is a somewhat similar group of eruptions occurring on the hands, but it is more variable, and the demonstration of a parasite is much more difficult. It is quite possible that some of the cases involving the hand that clinically fall into this group are not mycotic at all, but are caused by an external irritant. It is the author's belief, however, that most, if not all, of these cases will ultimately be found to be parasitic.

Incidence of Positive Wassermann Reactions in Four Hundred and Eighty-four supposedly Non-syphilitic Patients (Robert A. Kilduffe, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 2, February, 1922).—The results of 567 Wassermann tests on 484 unselected patients admitted to hospital are reported, with some discussion of the findings.

In 201 cases of pregnancy, one positive reaction with cord blood reaction corroborated by a positive reaction in the blood of the mother occurred, an incidence of 0·5 per cent. Nine positive reactions in the cord blood alone were obtained.

In 283 cases presenting miscellaneous medical and surgical conditions, forty-seven positive reactions occurred, an incidence of 6 per cent.

In the 484 cases of the entire series, approximately 12 per cent. of positive reactions were obtained; in twenty of the fifty-seven cases in which the patients reacted positively, there were either clinical or historical findings to corroborate the results of the Wassermann test.

Means of Infection in Fly-borne Disease (N. Faichnie, *South African Medical Record*, November, 1921).—The author is of the opinion that it is only excrement of fæcal-bred flies that cause enteric fever or bacillary dysentery to any great extent. The flies are infected in the larval stage, and therefore the place where they are bred is of more importance than the food they feed on. Night-soil pits are the greatest source of these flies. Four hundred flies have been bred from one single human evacuation. Where water drainage is not available, incineration, deep, or shallow trenching properly carried out, or modified septic tanks, should be adopted. All refuse should be disposed of by incineration or destructors if suspected of containing fæcal matter.

Laboratory Diagnosis of Typhoid (S. W. Paterson, W. W. S. Johnston and F. E. Williams, *Medical Journal of Australia*, November, 1921).—The authors found blood cultures of great value. During the first week cultures of *Bacillus typhosus* were found in 100 per cent. of cases. Blood cultures should be made in all cases of pyrexia of uncertain origin, and afterwards culture from the fæces can be obtained in the majority of cases. A positive result may often be obtained from the urine.

Treatment of Typhoid Fever with Intravenous Vaccines (K. D. Fairley, *Medical Journal of Australia*, November, 1921).—The author has achieved beneficial results from the administration of intravenous injections of typhoid vaccine in appropriate doses in this disease. Excessive febrile or focal reactions are not likely to occur, provided that proper precautions are taken to administer the correct amount of vaccine at the initial injection. The results of this treatment are the dramatic termination of the fever by crisis in 50 per cent. of cases; the marked amelioration or complete abolition of the toxæmic features of the disease in all treated

cases, and the absence of a fatal issue in the majority of cases.

Tannin Enemas in Amœbic Dysentery (Smyrniotis, *Presse Médicale d'Egypte*, No. 34, February, 1921).—The author is of the opinion that injections of tannin solution in cases of amœbic dysentery are very beneficial. The injections are given once daily por rectum, and contain tannin, 5 grm.; tinct. opii., 20 drops; arrowroot, 15 grm.; and water, 1 litre. The fluid should be retained for fifteen minutes. This solution is thought to cause rapid healing of ulcerations and destruction of the amœbæ.

Studies on Microsporidia Parasitic in Mosquitoes (R. Kudo, *Journal of Parasitology*, vol. viii, No. 2, December, 1921).—Microsporidian infection often is lethal in its effect upon the mosquito larvæ. In captivity infected mosquito larvæ die in much shorter time than uninfected ones.

Pupæ and adults so far examined are free from the infection. A new microsporidian, *Thelohania opacita*, parasitic in *Culex apicalis*, is described. The geographical distribution of microsporidia parasitic in mosquitoes is shown.

Tuberculosis of the Heart (Edward Weiss, M.D., *Archives of Internal Medicine*, vol. xxix, No. 1, January, 1922).—The brief clinical reports and necropsy findings of two coloured, young, adult males are recorded. Symptoms and physical signs were vague; necropsy demonstrated an immense, fibro-caseous tuberculosis involvement of the lymph nodes of the thorax, with extension to the pericardium, and in one case to the heart muscle, causing tremendous enlargement of the organ. Reference to the literature indicates that the heart involvement is almost always secondary to the disease of the mediastinal lymph nodes. The practical limitation of the process to the lymph nodes, the curious reaction of the tissues, and the difficulties in the diagnosis of such conditions are some of the problems offered to the pathologist and clinician by these case reports.

The Heart in Beriberi and the Evidence of the Differential Stethoscope (C. A. Sprawson, *Indian Journal of Medical Research*, vol. ix, No. 3, January, 1922).—About half the number of Chinese beriberi cases showed on admission some cardiac abnormality, which was usually slight enough to disappear shortly after treatment by rest in bed.

There was distinct evidence of myocardial debility, as shown by the differential stethoscope in beriberi cases. Both sides of the heart may be affected, the right usually somewhat more than the left. The use of the differential stethoscope was sometimes of aid in prognosis and treatment.

Abstracts and Reprints.

BACILLARY DYSENTERY WITH MEMBRANE IN THE VAGINA.[1]

By V. Lemann.

A married woman, aged 38, was seen in consultation on November 15, 1919. On November 3 she ate a cream puff which did not seem fresh. Next day she had severe pains in the epigastrium, and loose stools from straining. On November 5 nausea began. All the symptoms increased until November 10, when she was in a state of collapse; the skin was covered with a cold perspiration, the pulse weak and rapid. There was slight rigidity of the upper abdomen, and apparently a mass about the size of an orange in the epigastrium. This "mass" disappeared within a few days. The patient was given glucose and sodium bicarbonate, each 5 per cent. solution by proctoclysis, one-fourth grain of calomel every two hours, and later a teaspoonful of paregoric every three hours. No food was given by the mouth, only water.

When first seen she had improved; but the face was still somewhat pinched, the temporal fossæ were sunken, and the general appearance was that of great prostration. The bowel movements had continued to be numerous, bloody, mucous, and extremely offensive. She had vomited only once, though she suffered greatly from nausea. There was marked œdema of the abdomen, slightly greater in the right upper quadrant. She flinched slightly when pressure was made in the liver region, but the abdomen in general was not tender.

The liver edge was felt three finger breadths below the costal margin on deep inspiration. The heart and lungs were normal. At the introitus of the vagina a roughened, corrugated elevation was felt. The vaginal walls, vault and cervix felt œdematous. With the speculum, the rough, corrugated elevation was seen to be due to a thick, tenacious, dirty-grey membrane, which was pulled off with difficulty and left a superficial bleeding ulceration. On the cervix there was also an erosion with membrane. Rectal examination revealed nothing abnormal. The blood gave a strong agglutination with the Shiga bacillus. Shiga bacilli were cultivated from the vaginal membrane and the cervix. Other laboratory examinations were without special interest. The fæces revealed no parasites, but pus, blood, and epithelial cells.

The membrane in the vagina corresponded exactly with those described as occurring in the bowel in dysentery. How were the bacilli introduced into the vagina? The most plausible explanation seems to be contamination from the rectal discharges, especially as the inflammatory

[1] Abstracted from the *Journal of the American Medical Association*, p. 1716.

process was most extensive and intense at the introitus, and seemed to be ascending; or the infection may have been by contiguity within the pelvis. Flexner and Sweet assert that the bacilli may abound in the small intestine where no pathological lesion may be found, but they give rise to toxins, one of which acts on the lower bowel, the other on the nervous system. The excretion of the toxin causes exudation of lymph into the submucosa, and later into the mucosa, which leads to ulceration. The vaginal condition might have been produced in the same way. Another suggestion is, that the infection was carried to the vagina by the blood-stream. Cases of bacillary-dysentery septicæmia have been reported.

NOTE ON THE PHYSICAL ESTIMATE OF MALARIA DISABILITY.[1]

By Major Angus Macdonald, O.B.E., R.A.M.C.

Apart from the fatality, it is universally recognized that the debilitating effect of malaria is a matter of extreme gravity from the point of view of the individual, and especially of employers of labour. As an employer of labour under momentous conditions, the War Office, during the war of 1914-1919, was greatly handicapped by the loss of strength in the armies owing to malaria infection with its attendant debility and incapacitating sequelæ, real and presumed.

The loss of strength in the armies, due to real incapacity from malaria, has been serious enough; but perhaps even greater loss of strength has resulted from the failure—widespread—of medical officers to differentiate between the real and the presumed in their estimation of the physical condition of malaria cases. This failure has been common to youth and age, to the untrumpeted, and to those of reputation. It has been due to inexperience, awe of the *ignotum ergo terribile*, and to generosity, whereby the patient received the benefit of the physician's doubt. There was added, besides, the point of view of the general practitioner which, in private practice, wisely errs on the safe side, and widely in the terms of the advice given to the patients.

This combination of factors has been inimical to Army interests, to the service of the country at a time of crisis, and as well as to the men themselves, and resulted in the holding up in institutions, in Command depots, and on light duty in their units, of men long fit for service.

Special examinations were made of 172 men, all authenticated malaria cases, returned from various seats of war, and at the time under treatment at a Command depot. It was under question when the special examination was called for whether these men were fit for a Command depot or should be returned to hospital. All of the patients had been invalided for months, and about 30 per cent. for over a year, being under quinine treatment more or less continuously over these periods.

Apart from temperature and the indications of microscopical blood examinations, stress is laid on the spleen and hæmoglobin records. Enlargement of the spleen (*qua* malaria) indicates chronic extensive infection. Ten spleens were found enlarged so as to be just palpable (−1), and one spleen was appreciably enlarged without doubt (−2). But no spleen was found enlarged to such a degree as to make it a definite abdominal tumour (−3).

Malaria parasites were found in three cases. The men were under quinine treatment at date of examination. No analysis was made of the blood count record. The factors affecting a comparative leucocyte count are many, and while there are broad indications in the count, there is no sufficient pertinence to the question of fitness.

Study of the records of physical data may satisfy the reader of the justification for the estimate made and the recommendations given—seventeen men fit for Command depot, 155 fit to return to their units.

It is contended that there are physical data readily to be obtained sufficient to establish in the cases of the soldier his fitness for duty, and in the case of the civilian his fitness for work, apart from the academic question whether he may not still harbour a few stray malaria parasites in his system.

Discontinuous debility ascribed to malaria will require special judgment as it may occur.

[1] Abstracted from the *Journal of the Royal Army Medical Corps*. No. 2. Vol. xviii, February, 1922.

PUBLIC HEALTH IN THE DOMINICAN REPUBLIC. SPECIAL DISEASES.[1]

By Thomas W. Jackson.

Malaria.—From both laboratory and clinical observations it was possible to determine the varieties of malaria prevailing in Santo Domingo. Owing to the scarcity of anophelines in the capital city, new infections are not propagated among the people who reside in and confine their residence to the city. There are, nevertheless, many carriers, some "silent" cases, and numerous fresh clinical cases among the residents of the city, while the guardia (native militia) and marines, in their excursions from the capital into the interior and in their camps in the provinces, furnish a fairly large and constant supply of malaria cases. There is a constant flow of natives from the city to the country and vice versa, farmers, workmen, gardeners, sugar-workers, peons, &c. Moreover, many of the better class of people living in suburban homes suffer

[1] Abstracted from the *American Journal of Tropical Medicine*, vol. i, No. 6, November, 1921.

more or less constantly from malaria, and most of these suburban homes are infested with anopheles mosquitoes. House screening is practised scarcely at all as yet.

Subtertian, tertian and quartan cases abound in about the order mentioned. Except in those cases studied microscopically, the differentiation is seldom made and never with absolute accuracy. The pure clinician would probably take issue with me, basing his observations on apparent periodicity of symptoms and the statements of his patients; but to one experienced in the clinical phases and laboratory study of malaria, the difficulty of determining the type of infection with certainty from briefly observed symptoms and incomplete histories is sufficiently manifest. Combined infections (tertian and subtertian; or quartan combinations with the two tertians) are not uncommon. In passing it may be stated that more quartan parasites were encountered in months in Santo Domingo than in years of observations in Cuba, the Philippines and the Balkans. It is conceivable that the African origin of part of the population may account originally for the larger quantity of quartan cases, possibly introduced from that continent.

With regard to the existence of two distinct species of "falciparum" parasites (æstivo-autumnal parasites, crescent form gametes), I am still open-minded. I brought back a fair-sized collection of stained specimens for study. One could profitably devote at least six months of intensive study to Dominican malaria alone. Material is abundant for all reasonable purposes and easily accessible.

Intestinal Parasites.—Routine examinations of the stools of all patients admitted to the general and military hospitals of Santo Domingo were made during November, December, January and February with results not unlike those found in the other American tropics, including the Philippines. Eggs of the common intestinal worms, *Ascaris lumbricoides, Trichocephalus dispar,* and uncinaria (*Necator americanus*), were found in many stools, regardless of admission causes. The embryos of *Strongyloides stercoralis* and *Endamœba coli* and *dysenteriæ* were also encountered.

The reported prevalence of hookworm infestation, as determined in Dr. Grant's survey, based on about 2,000 stool examinations from inhabitants of all parts of the island, was found to be 52 per cent., and he estimates the percentage for the country at 50 per cent. This figure was obtained by taking percentages of separate areas as regards population and soil, pro-rating the infestation by the ratio of each area's population to the whole and averaging. It is interesting to note that our routine laboratory study of unselected cases for four months gave approximately a similar rate. The figures for ascaris infestation and other intestinal parasites are not available. Specimens of all the common parasites or their ova were secured, including the tapeworms and one specimen of *Schistosomum mansoni* ova (lateral-spined eggs), was encountered. The individual from whom this specimen was obtained was a young man who had visited Porto Rico and had resided in Haiti within recent years. Moderate anæmia and neurasthenic symptoms were present; also a coincident whipworm infestation (*T. dispar*). Diarrhœal cases and dysenteric stools yielded specimens of endamœbas (histolytica) and flagellates (trichomonas, *et al.*).

In staining certain stool smears for amœbæ, numerous spirochætæ were demonstrated, but their siguificance, if any exists, is purely speculative.

Sputum examinations for bronchial spirochætosis or bronchomoniliasis and for the ova of the lung fluke (*Paragonimus westermani*) were negative.

Tuberculosis, as indicated by positive sputum specimens examined in the laboratory, is apparently common, but as the cases demonstrated were general hospital cases, no deductions whatever as to prevalence are permissible.

Pneumococci associated with lobar pneumonia and diphtheria bacilli associated with the clinical disease were demonstrated in the laboratory.

With regard to syphilis prevalence, there are absolutely no criteria for basing an estimate for Santo Domingo. Limited military statistics are, of course, available, but it is by no means certain that they represent or approximate the rate in the general population. These military statistics may, in fact, be either better or worse than the population at large. Wassermann testing has not been practised extensively, and we are quite in the dark as to the prevalence of syphilis in Santo Domingo. Doubtless the rate is high. The manifestations of nerve syphilis, as indicated by various paralyses, tabes, &c., are far more common in the Philippines, if one may judge by the number of cases in the persons of crippled beggars seen upon the streets.

In a localized district not far from the capital yaws is known to prevail quite extensively, and an expedition from the Harvard Medical School recently visited Santo Domingo and conducted research study concerning this disease.

Rumours of cases of guinea worm among the natives of a certain section also came to me while in Santo Domingo, but I was unable to investigate or confirm the reports.

Yellow fever has been unknown for years. However, the distributing mosquito (*Stegomyia fasciata*) abounds in Santo Domingo and other towns, and is in fact one of the most numerous varieties.

Dengue also is endemic in the country, and filariasis, another mosquito-borne disease, is fairly common in and about Santo Domingo both with and without elephantiasis. One case of reversed periodicity in a policeman performing night duties was seen at the laboratory, the embryos being detected in his blood taken at our laboratory during the daytime.

Malta fever has also been observed in Santo Domingo, one of the university faculty having made

some epidemiological observation of cases in connection with Dominician goats (personal communication).

Typhoid fever and the paratyphoid fevers occur endemically, and Widal testing and blood cultures for diagnosis were carried out in the laboratory. These diseases would probably be more prevalent but for the fortunate circumstance that a large part of all the milk used is boiled before transportation or consumption, and that much of the drinking water used in the town is rain-water collected in cement cisterns above ground, cisterns unlikely from their location to be contaminated fæcally. Nearly all of the well water examined during the four months of observation was found to be contaminated, even deep wells in the limestone of the capital showing the presence of colon bacilli and gas formers. This deep contamination, of course, is quite characteristic of wells in limestone rock. Some very unusual subterranean caverns occur in the neighbourhood of Santo Domingo, and it is not surprising that rock faults in this vicinity permit these deep wells to be polluted.

Leprosy.—Leprosy received especial attention in January and February, 1921, because of the approaching time for the opening of the national leper colony, located at Nigua on the coast, fifteen miles west of the capital. The forty double cottages of concrete, the administration building, the kitchen and dining hall and dormitory buildings for the Sisters were then more than 90 per cent. completed. Arrangements had been made for twelve Spanish nuns from Europe to assume institutional care of patients and supervise the conduct of the colony. With the financial *impasse* of January the work of completing and equipping the buildings was suspended, and the whole project was discontinued. Within the past few weeks (July, 1921) I have learned that hopes are still entertained for the completing and opening of this colony, and that funds for this purpose may perhaps be found. Money for operation expenses will also be needed, of course. Preparatory to the transfer of the Santo Domingo cases of leprosy to the colony, seventeen were critically examined by the writer. Detailed instructions of the preparing of the mixed esters of chaulmoogric acid and the sodium salts from chaulmoogra oil were requested and received from Dr. E. L. Walker of the Hooper Foundation for Medical Research, of San Francisco, with a view to the preparation of our own materials for treatment at the new colony, and provisions for the reception of eighty patients had been made.

The department did not expect that this treatment for leprosy, which has recently been much acclaimed, would fulfil all the promises made for it. The claims made are believed to be extravagant, and have led to a false conception on the part of the people as to the curability of leprosy. Early diagnosis and careful selection of cases are necessary to secure even symptomatic cures. All of the Santo Domingo cases studied were proper ones for detention, but by a loosely supplied standard several might have been paroled. All had taken large doses of chaulmoogra oil by mouth for years, and indeed there were at large in Santo Domingo at the time quite a number of lepers who had been paroled in previous years, and considered but slightly menacing to their fellows. The fallacy and folly of such a policy are manifest from both clinical and historical viewpoints. Only with the permanent segregation of lepers throughout the countries of Europe, in lazarettos, following the great diffusion of the disease immediately after the Crusades and the Middle Ages did leprosy practically disappear from the continent. The best students of the disease to-day are conservative in their claims for treatment by esters and chaulmoogrates.

Nearly, if not quite all, of the Santo Domingo cases are cases of mixed leprosy wherein the signs of nodular, macular and nerve leprosy combined. Indeed, it seems quite probable that most cases of leprosy everywhere are of the so-called mixed variety from their onset, although the manifestation of one or other of the clinical groups of skin leprosy may be far more evident that the clinical signs and effects of nerve leprosy, particularly in the early years of the disease. The sequence in which the human tissues are invaded—skin, mucosa, nervous tissue, &c.—may frequently vary, but the early involvement of more than one of these tissues is practically inevitable in every case of leprosy, having in the mind the distribution of the bacilli by both blood and lymph streams.

Small-pox.—Santo Domingo has been visited by small-pox in years past, but until its reappearance there in 1920 the country has been practically free from the disease for nearly a generation. Some of the older Dominican physicians informed that in previous epidemics extensive vaccination was performed, at least in the vicinity of the capital. During the year 1920 cases were introduced across the border by natives from Haiti, where an epidemic of considerable proportions was raging. A controversy as to the identity of the Haitian disease, whether it was small-pox or "alastrim," so-called Kaffir milk-pox, continued there for some time. Meanwhile the Dominican Government, through the efforts of its Secretary of Sanitation, Dr. Hayden, successfully prepared for the advent of the disease by the wholesale and country-wide small-pox vaccination. In due time the disease appeared in the country and proved to be true small-pox. The clinical picture, its amenability to control by vaccination and every essential diagnostic feature were present. I saw the first fifteen cases at the capital, and observed the disease from its earliest to its latest stage. It differed not at all from small-pox as I have seen it in Cuba, the Philippines and the United States. Moreover, it originated from so-called cases of "alastrim" in Haiti. It is but fair to state that the diagnosis of small-pox was subsequently adopted in public health reports from Haiti. Our control efforts

through vaccination were extremely successful, but the usual anti-vaccination propaganda was carried on by unfriendly newspapers. Charges to the effect that the vaccine furnished by three well-known American firms contained the "streptococci of erysipelas" were made by a Dominician physician in the interior of the island. Accordingly, cultural tests of specimens of vaccine of all makes were made in the national laboratory with constant negative findings. Upon direct examination under the microscope of vaccine smears from all of the different American manufacturers, streptococci and staphylococci in small numbers were found, the chains appearing to be diplo-streptococci in most instances. As stated above, however, no cultures were obtainable from these specimens. The Secretary of Sanitation thereupon issued a circular calling attention to the requirements of the United States Pharmacopœia and United States Dispensatory for vaccine virus. The last editions of these publications contain specifications that vaccine shall be free from pathogenic micro-organisms, and that a special examination of each lot of virus shall be made to determine the absence of such organisms and of tetanus spores and toxins. Attention was called to the fact that the vaccine in use conformed to these specifications, and that cultural tests of all samples were negative. This bulletin was effective in quieting unfriendly clamours against vaccination.

Unless we are prepared to adopt a new name for a disease whenever it undergoes sufficient attenuation or modification to greatly reduce its mortality rate, I see no reason for changing the name of the mild form of small-pox which has prevailed, not only in the West Indies recently, but for some time past in the United States. The same observation is true containing the exanthema in general, and the recently declining curves in mortality rates probably indicate lessened virulence of many of the infectious diseases from causes of circumstances not understood.

Current Literature.

The Indian Medical Gazette.

Vol. LVI, No. 12, December, 1921.

Broncho-moniliasis (Taraknath Sur, M.D.).—The author describes a case of broncho-moniliasis which occurred in a European gentleman, aged 53, living in Calcutta. The patient had been suffering from a troublesome cough for about a year dating from a chill caught while on leave in England. He had been treated for bronchitis, pleurisy and renal stones, but without any relief. He suffered from asthma-like fits, prolonged hard breathing, and severe pain in the loins. The liver was enlarged and painful, and there was an evening rise of temperature, and on one ocasion after a troublesome bout of coughing he brought up a quantity of blood-stained sputum. Treatment consisted of emetine, potash iodide mixture and autogenous vaccines. The patient is still under observation and is doing very well.

The Indian Medical Gazette.

Vol. LVII, No. 2, February, 1922.

Syphilis in Relation to Mental and Nervous Diseases (Lt.-Col. A. W. Overbeck-Wright, M.D.).—The causes of idiocy or arrested mental development may be grouped into three classes—pre-natal, natal and post-natal—and syphilis figures prominently in the first and last groups. As a pre-natal factor, much depends on whether the ovum and spermatozoa are healthy. Syphilis is the causative factor in a very considerable percentage of cases of mental deficiency of whatever degree of severity, as it is present in 50 per cent. and sometimes more.

Syphilis is also the main causative factor in the production of that type of epilepsy which manifests itself at early ages, syphilis being present in an equal degree in those cases in which the epilepsy is associated with mental deficiency and in cases where no apparent mental defect exists.

The investigation by means of the Wassermann test into families of defective children who have given a negative reaction has shown that syphilis is associated with a still higher percentage of cases than is ascertained by the examination of patients alone.

The Prophylactic Value of Inoculation against Influenza from the Experience of an Epidemic at Khulna Jail (Sarasi Lal Sarkar).—The course of the disease during the influenza epidemic was not influenced at all by inoculation. The incidence rates in the last twelve days of the epidemic were 12·6 per cent. for the inoculated and 16·6 per cent. for the uninoculated. The difference between these is not sufficient to prove anything in favour of inoculation particularly, as the results are based on a small figure for the mean daily population of the uninoculated.

The Presence of Infectious Jaundice in Bombay (M. J. Parmamand, M.B., B.S.).—The symptoms of the cases of jaundice consisted of irregular high fever, ushered in with a sensation of chilliness and pain in the body, headache and intestinal disturbances. During the febrile period, which lasted from four to eight days, acute congestion of the bulbar conjunctiva was a well-marked feature. Then there was a period in which the fever dropped and deep jaundice developed. This period lasted for about eight days. In this stage, although the fever disappeared, the intestinal disturbance aggravated, and there was nausea, vomiting and extreme weakness. The pulse became feeble. There were restlessness and a tendency to hæmorrhages. Then followed a period in which the symptoms gradually abated and convalescence began.

Original Communication.

NOTE ON THE RECENT EPIDEMIC OF TROPICAL SEPTIC ULCER IN PALESTINE (TROPICAL SLOUGHING PHAGEDÆNA).

By Apost. G. Apostolides, M.D. *(from Smyrna).*

Late M.O. in charge Refugee Hospital in Haifa (Palestine) and Children's Hospital at Jerusalem.

During the year 1919 a type of epidemic ulcer has been prevalent in many parts of Palestine, and the A.D.M.S. (O.E.T.A., Palestine) has ordered a special report to be prepared on this matter. While the date, May, 1919, is given as the date of onset during which most cases were seen in the different out-patient and hospital clinics, there have been some patients treated in the earlier months with symptoms identical, who have been considered to have "crural or leg (varicose) ulcer."

There is no department of dermatology that has baffled our attention more than the ulcers of the legs, commonly classified as "varicose ulcer," "chronic ulcer," "sloughing ulcer," "phagedænic ulcer," &c. We have used such terms as a diagnostic entity or as a hazy cloak for our ignorance. But under the heading of tropical sloughing ulcer must be described an affection which, under various names ("Tropical Sloughing Phagedæna [1], Delagoa Sore, Rhodesian Sore, &c.) is exceedingly common in some parts of tropical countries, where it appears to be endemic as well as epidemic, and is due to specific micro-organisms [2].

It is characterized by a definite incubation period, followed by a complex of symptoms dependent on inflammatory, ulcerative and gangrenous lesions of the skin and subjacent tissues. It runs a chronic course, is amenable to salvarsan, and, to a certain extent, is influenced by local treatment. It is identical with *hospital gangrene* (contagious gangrenous phagedæna), which before the days of surgical cleanliness and the intelligent regulation of hospitals was extremely common in Europe, and under our modern ideas of the treatment of wounds and the management of hospitals it has practically disappeared, probably never to return. L. Freeman [3], Da Costa [4], P. Delbet [5].

In the writings of older authorities all kinds of microbic mortification were comprised under hospital gangrene; but in the course of time the term became more accurately applied to a certain definite variety due to a fusiform bacillus and a spirochæte called of Schaudinn, Le Dantec [6], Jeansèlme [7], Vincent. Vincent [8] has found the fusiform bacillus in association with the spirochæte of Schaudinn in all cases of hospital gangrene, gangrenous stomatitis (cancrum oris, noma), and endeavoured to prove that tropical phagedænic ulcer is identical with "hospital gangrene" and noma, and it is quite possible that he may be correct, as the appearances and symptoms of the diseases are very similar, although many observers have made more or less decided claims in this regard.

The geographical range of the tropical ulcer is very great. It is common in most tropical countries (South Africa, North Africa, Central Africa, Madagascar, Cameron, Red Sea Littoral, Yemen, Central America, &c.).

Gabbi [9] saw a case in Italy, and I, personally, treated in civil hospital practice and in my various hospital clinics 202 cases in Palestine.

Up to the date 1919 tropical ulcer has never been seen in Palestine. Scheube [10] points out that, on account of its relatively feebly infective power, it has a marked tendency to self-limitation. But in certain years so many members of a community are attacked that the disease may be described as being epidemic. Thus Lloyd Patterson [11] described one such epidemic which swept like a plague up the whole of Assam, and Tschudnowsky [12] says that half of the population of Borneo and Sumatra has been attacked by tropical sore. There seems to be no doubt that the infection in Palestine came from Mecca and Yemen by refugees; the disease spread from north to south along the line of the Cantara-Haifa-Damascus Railway.

The first cases seen by me in Haifa were in May, 1919, and during the latter part of April. Before the middle of July the epidemic was at its height. The insanitary conditions of oriental life greatly enhanced the spread of the infection. It is impossible to estimate the number of cases, as accurate information has not been received from the English authorities.

It was found principally in jungle lands, less frequently in towns and well-settled districts. The strip of flat, water-logged country lying along the foot of mountain ranges, the delta of small rivers, the pool-dotted beds of dried-up streams, areas of country which have fallen out of cultivation, are in many instances notorious. The first cases have been observed among the Armenian refugees, but I confess that at that time (April) I could not put a right diagnosis. On the contrary, their long duration, their resistance to local treatment, and, moreover, my ignorance, never having seen them before, made me suspect "primary tuberculous ulcers of the legs." But the excised specimens examined histologically and bacteriologically did not bear out this view. Circumstances were particularly favourable to the study. Being at that time stationed at the "Isolation Hospital" in Haifa, I had also charge of a camp of stone-workers belonging to Mr. St. Sturgess near Zammarin Station. The arrival in the out-patients clinics of a large number of patients from this camp with symptoms referable to septic ulcer terminated definitely my uncertainty, and suggested at once that the disease is transmissible from man to man, and some other than the common micro-organisms should be the causative agents of it. Microscopical examination of excised specimens showed a very delicate spiral-shaped spirochæte in association with

the fusiform bacillus—both identical with those met with in "Plaut-Vincent's angina"—were responsible for the lesion in about 75 per cent. of all cases.

Microscopical examination of the discharges of the ulcer showed always the common pyogenic micro-organisms, *Staphylococcus pyogenes aureus* and *albus*, *Streptococcus pyogenes*, &c. But I failed to find out the fuso-spirillary germs, the true causative agents of the ulcer. Vincent [13] too remarked the frequent concurrence of *Spirochæte schaudinni* and fusiform bacilli in the sores, an observation confirmed by several others (Todd, Wolbach [14], Prowazek, Lloyd Patterson).

Following this as a reasonable basis for investigation, I was waiting for the first case of ulcero-membranous angina to prove it. In October, 1919, I was transferred to Jerusalem, where I observed some cases of tropical sore among patients attending the "children clinic," but larger numbers have been seen in the Ramalah sub-district, where more than half of the hospital's patients were suffering from ulcers, and three-quarters of all dressing cases of the "out-patients" belonged to the same cause. At the same time two cases of "ulcero-membranous angina" came under my observation, in which the fuso-spirillary germs were found in abundance. Bandaging some parcels of these pseudo-membranes taken from the above two cases on the surface of an abrasion of the skin made by some scarifications, I succeeded in two instances in producing a characteristic tropical ulcer in the centre of the inoculated spot within the recognized limits of the incubation period. Microscopical examination of these two ulcers in Haifa Laboratory showed large numbers of a bacillus with pointed ends, each 1·1·2 micron long, which, according to A. Meyer and Gottheil [15], was the *Bacillus fusiformis*. Two or more were jointed end to end and accompanied by a spirochæte which showed all the characters of the *S. schaudinni* [16]. I have then furnished a more convincing evidence of the absolute identity of the organisms concerned in the production of the ulcero-membranous angina and tropical ulcer. Up to now it was generally believed that the tropical ulcer is not readily communicated by ordinary inoculation either to man or to the lower animals (Manson) [17]. Only L. Patterson succeeded in producing it in one instance. By these experiments of mine and by a long series of carefully conducted culture experiments on the ulcer, I succeeded in four more cases in demonstrating that (1) the virulence of the germs is destroyed by temperature of 55° C.; (2) superficial discharge of the ulcer contains very seldom the pathogenic germs, and therefore is liable to produce only typical boils, but not tropical ulcer; (3) in order to confirm the diagnosis a bit of tissue should be removed, and the removed piece must include a portion of the edge of the ulcer; discharge taken from the surface of the middle of the ulcer gave often negative results; (4) that the germs are present in the deep discharge, at all events in a transferable state, only during the first two to three weeks of the disease; inoculations carried out with discharge of ulcer more than four weeks old failed always.

Although we recognize the fusiform bacillus in association with the *S. schaudinni* as the only important pathogenic agent of the ulcer, there are nevertheless certain constitutional conditions which tend to favour the development of tropical ulcer. Among the circumstances which predispose to the active clinical manifestation of the tropical ulcer, debility from previous illness, overwork, bad food, or hardship have undoubtedly a powerful influence. Exposure to long-continued heat and residence in insanitary localities, aided perhaps occasionally by a scorbutic or syphilitic taint, have been found in 65 per cent. of all my cases. It was usually in those who have suffered from malaria (P. Manson) [18], or who are "run down" from any cause, that ulcer appears (A. Plehn) [19], although cases have been reported in strong, healthy individuals. An analysis of my cases reveals that in 89 per cent. it occurred in men or children who were more closely and frequently grouped than other men. In 5 per cent. of cases all these men sleeping under the same canvas were altogether affected. But in 95 per cent. one member after another. In the out-practice between well-to-do families I saw very frequently only one member of the family attacked, while others remain sound, and oftener children from about 12-14 years are more apt to it. All ranks, sexes, ages and classes of the population may be affected, but they are not equally subject to it; it more commonly affects men from 25-35 years of age, obviously on account of their greater exposure to its causative agent. Children under 5 years of age are very seldom attacked (2 per cent. in my cases). In Palestine natives and coloured men were attacked in great numbers, whilst Europeans are said to enjoy an immunity (A. Apostolides, Breda, A. [20], Le Dantec [21], Brault [22]).

In the after-war time there have been a large number of Europeans in Palestine, but generally they were less liable to it than recent arrivals, and when they got it the course was very mild and short. In the Zammarin Station near the above-mentioned stone-workers' camp there was the Thirty-fifth British casualty clearing station. While 95 per cent. of the men of the camp were suffering from the tropical ulcer, only two cases attended the Thirty-fifth casualty clearing station for treatment and one private from the hospital staff. Some authors, and especially Gros [23] and Boinet [24], have combined to create a mass of ill-digested literature out of all proportion to the practical importance of the subject, dwelling upon petty details of little scientific value—namely, it is often said that most of the cases of ulcer are seen at the end of the rains when the soil is beginning to dry up, &c. As regards the relation of the prevalence of the ulcer to men, there have been too many generalizations based on the limited experience of one or two districts.

To sum up, whatever the predisposing cause may

be, in all cases we require the presence of the active excitant. In other words, any condition, physical or hygienic, which tends to reduce the tissue vitality below par and to lessen the resisting power of the organism as a whole, may be rightly regarded as a predisposing cause; but all recent observers recognize—and our own cases and experiments confirmed their opinions—that the only causative agent, the *sine quâ non* of the tropical ulcer, is the fusiform bacillus in association with the *S. schaudinni*. There can then be no doubt that it is a specific disease (Meijer) [25]. There are, however, both in England and on the Continent, members of our profession who still regard this disease as a variety of either staphylococcus or the bacillus of Welch, or as a mere manifestation of malaria (Cross) [26]. A. Plehn [27] states that tropical ulcer is a disease of poverty and misery.

Mode of Transmission.—In what way under natural conditions the germs enter the tissues it is as yet impossible to state definitely. That the disease is propagated by direct contagion from man to man is a fact that is agreed to by all observers (Manson, Keysselitz and Meyer [28], &c.). Patients suffering from other wounds occupying beds next to cases of tropical ulcer contract it in the majority of cases. That the infection takes place through the broken skin, as has been performed artificially by me in the above-mentioned cases, and by Vincent in the case of guinea-pigs, it is evident. The preponderance of the ulcers in legs among people with *bare feet* is the best proof of infection through the skin. Among people that go about barefooted cracks and abrasions on the feet are common, and this fact was used as an argument in support of this mode of infection. But the same preponderance of tropical ulcer occurs among Europeans when booted, and in most epidemics in whatever part of the world they may occur leg ulcers are the most frequent, although cracks and abrasions occur oftener on hands than on legs.

Sometimes a prick or scratch with an infected instrument may introduce the infection into the skin. For instance, at Ramalah a nurse of the hospital had the front part of her left forearm accidentally scratched by an infected knife with which I had incised a tropical ulcer two hours before. The wound was immediately washed and bathed with a solution of lysol. In two days a papule appeared below the skin, which rapidly broke down to a typical ulcer, cured completely in ten days by 3 per cent. ointment of methylene blue and intravenous injection of neosalvarsan 0·45. There are certain facts, however, which seem to indicate the possibility of ætiological factors which hitherto have escaped observation. Filth and overcrowding imply close proximity of the sick and the healthy, and one can understand how in such circumstances the germ has opportunities to multiply and spread. On the various theories which attribute its occurrence to climate, exposure to sun, &c., we need not waste our time, but refer readers back to the action of predisposing causes. The fact that some patients have used well water accidentally polluted for flushing and washing purposes has led some of the medical men (A Plehn [29], Lenz [30], &c.) to the belief that polluted water is the cause of the infection. There is a fallacy, however, in this theory. The writer has endeavoured during his service in Palestine to follow up the cases which have occurred in the barracks under his sanitary care, and to group them with reference to locality and possible causation. By careful analysis and inquiry certain possible instances were demonstrable that the disease is transmissible from man to man by means of some insects which attack only uncovered parts of the body and often in the night time. This insect, I believe, to be the mosquito as the insect whose habits seemed adapted for such a purpose, and whose distribution conformed to the well-ascertained habits of tropical ulcer.

A strong support is given to this hypothesis by the fact that tropical ulcer is endemic in the same parts of the world with malaria, and attacks individuals suffering from it so frequently that some writers (Gross) regard tropical ulcer as a malarial manifestation. In regard to this opinion that insects were the means of conveying contagion the following remarks are very interesting.

(1) The population of the camp near Zammarin Station, mentioned above, was about 160 men, women and children over 10 years old; of this number *116* were skin-coloured men inducted into work from Egypt; forty-four have been gathered from the neighbouring village of Zammarin. Both groups were working the same work, they moved freely about in the neighbourhood, exposed themselves in all weathers, drank the same water and ate the same food, and beyond retiring from sunset to sunrise to their huts or tents, were sitting under the same canvas. But at 6 p.m. the Egyptians entered their own tents, while natives were allowed to go to their houses, five miles away from the camp. In a period of two months 97 per cent. of the first group, *which was sleeping in the camp*, were affected with the tropical ulcer, while only 2 per cent. of the second group, which was sleeping in their houses. I inspected the village, and I found that for its size it has a very large proportion of filthy slums and insanitary houses. The insanitary houses were at that time overcrowded: their lack of light and air was similar to that of the tents, or worse. The natives are as dirty in their habits as the poorer coloured people.

But very few mosquitoes and swarms of flies between milliards of fleas have been found there.

(2) I sent once my assistant, Mr. Basil Gheorghiou, to the camp to put in order my pharmacy-tent, instructing him to avoid any contact with the population working there. But on his return he missed the train and was obliged to spend a night in the camp. As it was July and the weather very warm, he preferred sleeping in open air than in camp, avoiding any source of infection. Notwithstanding these precautions, two days later a typical tropical ulcer developed on his

left leg. Raynaud, Cros, Le Dantec [31] also have remarked the great coincidence of the tropical ulcer with malaria in the same localities. These and many similar facts observed in Palestine with regard to the transmission throw important light on one of the ways in which the disease is spread. But the exact way in which the insects (mosquitoes (?), sand-flies (?)) transmit the germ is not known—whether the germs undergo important biological changes in the insect—which I do not believe—or whether the latter functions merely in a passive or mechanical way. There are certain facts which tend to suggest that the carrier need not necessarily be a blood-sucking animal.

In the first place the same germs are often present in ulcerations of the mouth. Secondly, some wounds may become infected with these germs only by putting them in contact with material containing the fusi-spirillary germs. It is then conceivable that such insects might transmit the infection of tropical ulcer by depositing the germs on wounds and abraded surfaces. The part played by insects in the propagation of certain infectious diseases (typhoid fever and paratyphoid fever, Rolleston [32]; cholera, G. C. Low) has been proved for a long time. Attracted by the foul discharges of the ulcer (material of dressings full with pus, pseudo-membranes, blood, &c), the insects carry off the bacilli on their legs and proboscis and convey them elsewhere. Many bacilli live in the intestines of flies, mosquitoes, &c. (Celli, Odlum), which are therefore bacilli carriers. They become filled with infectious bacilli either some distance away or in neighbouring houses, and thus laden with elements of contagion, they carry them into kitchens or canteens and deposit them on the food, fruit (cases of Plaut-Vincent ulcero-membranous stomatitis), or on the hands and legs, applying them to some pre-existing wound or sores or abrasion of the skin, or inserting them into the skin (cases of ulcus tropicum). They are contagious, not only by their legs and proboscis, but also, and perhaps most of all, by their excreta, for they defæcate very frequently (Rolleston). Parting from that idea, search was made by me from breeding places of mosquitoes and flies in the neighbourhood of Zammarin Camp, where I discovered that ulcer patients threw their old foul dressings *near* the grassy banks of the stream, and there were heaps of old dressings with horribly stinking pus and milliards of flies and mosquitoes. This was probably the source of propagation of the infection in this camp.

The fact that the workmen who leave the camp at 6 p.m. were not affected by the disease is easily understood if we remember the habits of the mosquitoes, and indeed mosquitoes begin to move after sunset. They thrive best in sluggish streams with grassy banks and many backwaters; still better in small pools or other collections of water where the surface is not agitated by winds. The usual methods having failed, a systematic destruction of the insects was carried out. The epidemic which was at its height in August at Zammarin ceased, and not a single case more of ulcer was observed in this camp, while in Haifa and Jerusalem it continued till December.

We have thus undoubtedly an explanation, in part at least, of the predominance of tropical ulcer during the summer and autumn, which are favourable seasons for the multiplication of mosquitoes and sand-flies, as well as in the localities near banks of rivers, pools, &c., where mosquitoes and flies swarm in such abundance. This also explains why the houses of the poor in which attention to cleanliness and hygiene is too often neglected, and which serve as a home for myriads of flies during the summer, are frequent foci of tropical ulcer, especially in war-time, and for that reason the disease is called a disease of poverty and misery (Castellani and Chalmers [33]. We need only mention in passing the rôle of flies and lice, which has sometimes been invoked, but never actually proved. The constant absence of the germs in the blood of the ulcer patient prevents us from supposing that this mode of active contagion is even possible. Arriving in Jerusalem, I reported the results of my investigations to the A.D.M.S. of Palestine, Col. Heran, R.A.M.S., through the D.A.D.M.S. of Jerusalem, Major Henderson, R.A.M.C., on January 1, 1920, giving a description of the parasite and drawing the attention of medical men in Palestine to this mode of transmission.

This cause, if such it be, must therefore remain *sub judice* and await further investigation. The writer has heard from medical men in Palestine of cases arising among passengers on mail steamers, or individuals from which occasionally spend a night in Haifa. The writer regrets that, owing to lack of spare time and money, he has been unable to carry these investigations further, but hopes that others will carry on the work, so that the question may be placed upon the firm and certain basis that more confirmatory inoculation experiments can only supply. I must, in the meanwhile, leave the question to my tropical colleagues, who are in a better position to judge. W. D. McCaw [34], in his monograph "Tropical Surgery," has stated somewhat similar opinions but without recording the facts, and still is the only author who agrees with me on that point.

The influence of dust, polluted with human fæces as a cause of tropical ulcer, has not in the writer's opinion been sufficiently investigated. It is well, however, to bear this possible, if improbable, cause in mind when dealing with excavations connected with old sewage drains, &c.

Histology.—Histological examination of ten cases showed the common phenomena of the ulceration and sloughing. The ulcer was surrounded by a zone of inflammation, which often caused more or less infiltration with thickening and elevation of the tissues; the exudate in this zone consisted largely of polynuclear leucocytes, the subcutaneous tissues were involved in most cases, and presented a fairly uniform picture of acute inflammation of the whole

skin with destruction of the superficial fibres of the muscle. In more severe cases the muscles began to soften and disintegrate structurally. They lose the receptive power for anilin stains together with their structural outlines, until they finally approach a slimy fluidity; the whole tissue, with exception of bones, tendons and the tougher fascial, being transformed into a more or less homogeneous mass. In ulcers with a tendency to heal, fibroblasts were in preponderance, and fibrous tissue was appearing. I cannot enter into full details of the repair of the ulcers which are not different from those written in the text-books of general surgical pathology (F. C. Wood [35], E. Lexer [36], Lecène [37]).

Incubation Period and Constitutional Symptoms.

The common symptoms of tropical sore are familiar enough and need not be described here, but there are some manifestations of rare occurrence which, although recorded in the text-books, may not be referred to their proper cause unless their relationship to tropical sore is borne in mind. Such errors are to be regretted, because the symptoms are often alarming in character, but yield readily to proper treatment. In my description I will follow the excellent report of the A.D.M.S. of Palestine. The incubation period of tropical sore is not stated in the above-mentioned report, and most text-books do not give an accurate account of it. It is certainly not a long one. In the case of my assistant, as well as in those of experiments, it was from two to three days. I have seen a case in which it could not have exceeded forty-eight hours. This case is very interesting and must be mentioned here.

A Catholic nun of about 23 years was bitten in an expansive moment of love above the nipple of the left breast—this common instrument of the modern erotic gymnastics—by a man suffering at that time from acute tonsillitis. The nun, a very clever woman, having performed nurse duties in one of the biggest Turkish military hospitals during the war, knew quite well what a bite wound meant, and attended at once the out-clinic of Ramalah (she was living in a village fifteen miles away) four hours after the accident. We found a small bluish contusion of the shape of the incisive teeth without a breach of surface continuity—at least, not visible with the naked eye. I painted it with tinct. of iodine, and dressing it dry, I sent her home. Forty-eight hours after she returned with a typical papule just below the bruised skin of the left breast; later on it broke down into a tropical ulcer. I ordered the man who bit her to be examined, and I found him suffering from *ulcero-membranous stomatitis*. I sent the specimen to the laboratory of the A.Z.M.U. in Jerusalem. *The fusiform bacillus associated with the S. schaudinni was found in abundance.*

The tropical sore is usually on the exposed parts of the body. In my own cases 85 per cent. ulcers were situated on legs and feet—especially in young children 10 years old; arms and hands, 12 per cent.; buttocks, 2 per cent.; breast, 1 per cent. Never on the trunk, the palms, soles or hairy scalp. Raynaud [38] saw the ulcer in shoulder and pubis. It is usually single, but it may be multiple. Two are not uncommon, but in rare instances as many as four have been counted on the same patient. My own cases run as follows:—

Single, 90 per cent.; in both legs, 6 per cent.; in leg and arm, 3 per cent.; two on the same leg, 1 per cent. If the disease occurs in previously sound skin, the first manifestation is the formation of a larger papule just below the skin, with symptoms of slight itching and burning (50 per cent. of all cases). Only in 40 per cent. it is very painful in the beginning. After a period of from one to two days the papule is surrounded by a red area and œdema. It rapidly increases in size and painfulness and becomes almost black in colour. If incised at this stage a small necrotic mass is found just beneath the skin with a bead or two of pus. When in the course of a few hours, or even some days (L. Raynaud [39], Blaise [40]), the papule breaks down, an ashen-grey, moist slough is exposed and an angry ulcer with horribly bad smell and sloughing surface is formed. The ulcer is round in most of the cases (78 per cent.) and oval in some instances (20 per cent.). When the disease is developed on a pre-existing wound or sore its surface rapidly assumes the appearance and characters of the sloughing ulcer. Most of the ulcers by the time they reached me for treatment showed a widespread lesion which covered a round area of the size of a five-shilling piece; it easily bleeds on being touched with an instrument or with a cotton pledget. It tends to spread rapidly with undermined edges, but generally it does not tend to penetrate deeply. When the sloughs separate there is for about two or four days (Apostolides) [41] a discharge of thick tenacious pus, also horribly stinking. When the slough begins to liquefy it is followed by a more abundant thinner discharge and the pain now diminishes, but the ulcer still continues to extend at the periphery. Between five and six days the clinical signs, if not stopped, become marked and positive. The infection starts in the muscular tissue, and spreads within muscles and sheaths and along fascial planes with very great rapidity, and muscles tend particularly to become gangrenous. The rapidity of spread is explained by the structure of the muscles. The sheaths of individual fibres are easily detached, and when detached form spaces along which toxic matter passes to cause necrosis of the fibres (Wallace) [42]. Mixed infection by aerobes (staphylococci, streptococci, &c.) adds greatly to the danger, because these becilli appropriate oxygen and anaerobes grow without restraint. In some cases great swelling occurs. The surrounding parts are inflamed and painful, and buboes form in adjacent lymphatic glands (only 10 per cent). In some bad cases a group of muscles becomes involved (Brault [43], Plehn, A.), and the infection is apt to spread to adjacent tissues, destroying muscles, tendons, nerves, vessels, and even the periosteum of the bones (L. Raynaud, *loc. cit.*). I have seen such cases several times, especially in

careless patients, particularly if they have been obliged to use the limbs. I have seen gangrene of an entire foot. But such great rapidity of progress is not the rule. After two or three days of this state septicæmia develops which may carry off the patient (Plehn, A., Manson, P. [44], Castellani and Chalmers [45]).

Some writers on the Continent have published many elaborate articles on the subject, insisting upon the existence of two separate forms of tropical ulcer. In accordance with the majority of the authors (Brault, H., Vincent, L., Raynaud, Le Dantec, &c.), we categorically refuse to accept the existence of two separate forms, having found in both as well as in the mild ulcerous form, as in the severe form of sloughing ulcer, the same micro-organisms. In the sloughing cases near a joint the ulcer penetrates deeply, and after a time the bone is laid bare or the joint open. The discharge from such ulcer is thin and scanty, and the ulcer is very chronic; the foot is œdematous. The ulcer may heal when the patient is kept in bed and open again when he gets out. I have seen a case of sloughing ulcer turned into a Marjolin's ulcer in a man of 48 years. The malignant change began at some point of the edges of the ulcer, and its first evidence was induration. A microscopic examination showed epithelial infiltration of the apparently sound tissue. In cases reported by Sir P. Manson, L. Raynaud, Brault, tetanus, erysipelas, lymphangitis with chronic œdema of the leg, neuritis, complicated tropical ulcer. Complete gangrene of the extremity in which amputation was indicated and performed is met with in many instances by some authors. I confess I have never seen such a severe complication throughout Palestine.

Tropical ulcer is very seldom fatal, and is often recovered from, even after months. Death may, however, ensue from exhaustion caused by sleeplessness and pain in very debilitated and cachectic individuals from septic absorption from some complications (gangrene, sapræmia).[1] But in many cases, even of gangrene of a limb, recovery may occur after treatment with neosalvarsan, an observation it is important to bear in mind before amputating. When a limited area is gangrenous constitutional symptoms are trivial or absent; there is usually fever, but the temperature may be normal or even subnormal. Bleeding due to sloughing may occur at any time. Death may occur from the opening of a large blood-vessel (P. Manson, Plehn). In a case of profuse bleeding in Ramalah Hospital I was obliged to open the ulcer, tearing the flaps apart with the fingers, find the bleeding posterior tibial artery, and tie it.

Fortunately in the majority of the cases the deeper structures are spared, the disease being relatively limited and superficial (in 92 per cent. of our cases). We have never seen the bone sharing in the gangrenous process. In very severe cases great deformity ensued from strangulation of a distal part by a contracting scar. Granulation is slow and frequently interrupted. Often it commences at the centre, whilst the ulcer may be still extending at the edge. After several weeks and sometimes months (L. Raynaud) healing takes place, but in well-treated cases in a period of from eight to twelve days. So was the time ordinarily seen when patients eagerly sought and received the most prodigal medical attention. In the indifferent, careless, negligent and often indigent patient the ulcer showed a persistence to become chronic, which nothing could favourably influence except neosalvarsan in connection with prudent application of the radiant heat (see below). As a rule I have not seen the ulcer recurring more than once. But L. Raynaud thinks it is a frequent occurrence. No man died of ulcer, but it disabled him in 14 per cent. of our cases. A curious thing is that Wassermann's test was positive in 61·8 per cent. of cases of ulcer. Early in the stage of initial lesion the test was negative. Schüffner [46] and Plehn applied it in many cases, and found it positive in 86 per cent. of well-developed ulcer. In about one-fifth of cases the test became negative two months after complete treatment. The writer has not great experience of the persistence of Wassermann's test, having applied it in very few cases. The Wassermann's test was carried out in the laboratory of A.Z.M.U. at Jerusalem and the Government laboratory in Haifa. In two private cases the test was made in the Jewish institution and was positive.

Treatment.—Early and radical treatment is imperative. Removal of dead tissue, free incision, sterilization of the wound with iodine or solution of hypochloric acid (0·5 per cent.), the use of Dakin's fluid, will almost arrest the gangrenous development of the ulcer, but not cure it.

J. Regnault [47] warmly advocates solution of chloral 20 per cent. and Plehn powder of bismuthi subnitras and zinc oxide, after having washed it with Condy's red fluid. Fontoynont and Jourdan [48] and Forest [49] recommend a dressing with 5 per cent. solution of *eosin* and exposure of the limb to the sun. Tschudnowski recommends an ointment with iodol, 5; glycerin, 0·5; gum. arab. pul., 1. In the beginning I have treated all the cases with very hot (45° C.) 0·50 solution of potass. permanganate, given the patient nourishing diet, stimulants and tonics, and small doses of opium, which Dr. G. W. Gay [50] warmly advocates, as it relieves pain, quiets restlessness, and is a vascular tonic which increases the nutrition of peripheral parts. Duration of treatment in mild cases was from ten to twelve days in 68 per cent. of the cases. But in severe cases the results were not so satisfactory. Later on, especially in severe cases, I dressed with warm antiseptic fomentations and iodoform, and every day picked away dead bits with the scissors and forceps. Results the same as

[1] In the review of some of the earlier literature on the subject of phagedenic ulcer one is struck by the frequency of such severe complications due to a bad diagnosis and especially to the bad treatment. Ponteau (Lyon), in 1783, christened the condition "hospital gangrene" quite rightly.

before. Very often I have used the technique of Sir P. Manson [52] particularly for hospital patients. In Ramalah Hospital I applied this method in connection with the radiant heating of thermocautere as follows: The patient was put under chloroform, the slough thoroughly dissolved off by the free application of pure carbolic acid, the tissues there were exposed to the radiant *heat of the thermocautere* at a distance from 12-15 cm.; afterwards I enveloped it in an aseptic lint and dressed with hot dry wool.

The limb should be elevated, and after two days' immobility should be placed again under some improvised irrigator from which Dakin's fluid—like in the Carrel-Dakin technique—will trickle continuously on the surface. I confess that this technique gave me the best results before the use of neosalvarsan. Duration of treatment was eight to ten days for the mild cases and fifteen for the severe. Sometimes I used instead of pure carbolic a solution of carbol. ac., 3, camphor, 7, glycerin, 40, and alcohol, 180; peroxide (= dioxide of hydrogen), iodoform, euphoren, silver nitrate, formalin, lysol, tr. of iodine. Carrel-Dakin method, dichloroamin-T in chlorinated paraffin and eucalyptus have been employed in several cases repeatedly with little and sometimes with no real value. Only the above-mentioned solution of dichloramin-T gave me great satisfaction. X-ray and light treatment have been tried by many authors with success. Bruas [53] has used with success Bier's method, which is warmly advocated by Jenselme and Rist.

But the best results were obtained by intravenous injection of neosalvarsan, 0·45-0·60, according to the cases, and the local application of an ointment of 20 per cent. salvarsan. I can but warmly recommend it as the best and surest treatment of tropical ulcer, especially in severe cases. In very severe chronic cases two intravenous injections of neosalvarsan, 0·30-0·45, cured the disease in ten days, while all the other remedies have failed to check it. Intravenous injection causes symptoms to pass away rapidly. Beneficial effects of this treatment are particularly manifest in early tropical ulcer (Werner [54], Assmy and Kyritz [55], Kulz [56], Rodenwald [57], Hallenberger [58], Schüffner [59], &c.).

In more advanced cases, if free incisions, extirpation of necrotic muscles and other tissues, the Carrel-Dakin treatment, neosalvarsan, cauterization with thermocautere, removal of the sloughs, fail, amputation will be necessary to save the patient's life. In rapidly advancing cases amputation is the only chance (Plehn, A. Raynaud, P. Manson, and others).

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The Domestic Pig and Hookworm Dissemination (James E. Ackert, Ph.D., and Florence K. Payne, M.D., *American Journal of Hygiene*, vol. ii, No. 1, January, 1922).—Human hookworm eggs swallowed by domestic pigs produce infective larvæ in five days during the rainy season in Trinidad. The results of tests indicate that a high percentage of the hookworm eggs ingested by pigs are able to produce infective larvæ, and that the free-range pig is an important factor in the dissemination of human hookworm eggs.

Infective hookworm larvæ swallowed by pigs do not pass through unaltered in the excrement. *Strongyloides stercoralis* larvæ survive passage through the digestive tract of the pig and multiply in the fæces. Circumstantial evidence shows that the pigs become infested with this nematode.

A new species of hookworm, *Necator suillus*, is of common occurrence in the domestic pigs in Trinidad, British West Indies.

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THE JOURNAL OF

Tropical Medicine and Hygiene

April 1, 1922.

SIR FREDERICK LUGARD ON TROPICAL ADMINISTRATION.

In several of our magazines of the more seriously-minded class the subject of the administration of the tropical colonies of the Empire has been dealt with in a manner becoming, for the most part, to the writers of the articles which appear at intervals from time to time. Since the nations and all

governing bodies in the world have been put, as it were, into the melting pot and the position of Governor and subject are being considered anew, it behoves everyone to gain a work-a-day knowledge at least of the manner in which the Crown Colonies are administered and our Protectorates dealt with. For the medical officer serving in his department of Colonial government the subject is of importance in an acute degree. He has theoretically nothing to do with the framing of the laws under which he serves, and it depends upon the capability and temperament of the Governor under whom he serves, and to a lesser degree upon the quality of the local Legislative Council, whether his service is to be efficient and peaceful or a bed of strife, chaos and waste of time.

Sir Frederick Lugard has been lately dealing with the present and future status of our Crown Colonies and Protectorates, and giving us of the plethora of an experience which is well-nigh unique. His name has been on the lips of every man as one who has known the tropics for many years, and to those who know it not it is useless to introduce him, for he is no drawing-room hero to be trotted out for the "climbers" in society to entertain and lionize, but a hard-headed, hard-working man, "full of wise saws" and earnest thinking.

In *The Times* Literary Supplement of March 9, 1922, an article extending over two and a half columns sets forth the whole subject of Crown Colony and Protectorate Government in a masterly manner under the title of "Tropical Administration: The Dual Mandate in British Tropical Africa," by the Right Hon, Sir F. D. Lugard (Blackwood, 42s. net). Although versed beyond most, (if not all) men in West and East Africa affairs, Sir Frederick knows India and China, for he was Governor in Hong-Kong for some years.

"Sir F. Lugard's views are clear-cut and decided, but he has succeeded in presenting with admirable candour both the facts and the reasons which tell against his own conclusions, with the result that his work will prove invaluable to the colonial administrator, the Member of Parliament, and students of politics. The merit of the work is enhanced by its completeness; it covers the principles and machinery of administration, the law and the Courts, methods of ruling native races, taxation, land tenure, slavery, labour, education, transport, trade, and economic development; it investigates the acquisition, status and conditions of the British tropics, principles governing control in the tropics, the people of British Tropical Africa, and the thorny problems of Colonial Office control, missions, the liquor traffic, and the use of native armed forces.

"Sir Frederick Lugard's solution for the problem of government in tropical Africa rests on constituting the native chiefs 'an integral part of the machinery of the administration,' and in devising 'a single Government in which the native chiefs have well defined duties and an acknowledged status equally with British officials.' The advantage of such a solution is obvious in the case of the Moslem States of Northern Nigeria; but Sir F. Lugard is convinced that the anarchy prevalent among the pagan races, which has been aggravated by the advent of the European, can be counteracted by building up 'a tribal authority with a recognized and legal standing, which may avert social chaos.' Direct British rule among primitive tribes is efficient, but it is costly, and above all it shirks the more difficult task of education, and when the time comes—as it inevitably will come—and the people demand a voice in the control of their own affairs, we shall find—as we find in India to-day—that we have destroyed the natural institutions of the country, that we have sapped the foundations of native rule, and have taught them only the duty of obedience. We can then only offer an alien system, evolved by Western nations to suit wholly different circumstances, moulded on European and not on native habits of thought."

The "obedience" teaching has its benefits in some ways perhaps, but when it is administered rudely and unwisely the penalty may have to be paid in future. It is said to have been "Gandhi" travelling first-class on the railway in South Africa, when he was thrown out for daring to do so by a fellow-traveller—a Boer it is said, but just as likely a Briton—that turned his feelings against the British, and tended thereby to hasten the "Gandhi" revolt in India. The writer, when on the way out to China in 1887, saw something of the way British mates of the ship behaved towards the Chinese. A large shipload of Chinese labourers were being carried from Singapore to Hong-Kong; there was barely room for so large a contingent; they had to squat anywhere about the stairs, decks, and the hatches. As the hatches had to be moved now and again, the men sitting on them were driven off by rope-ends, kicks, and other unbecoming measures. At the time the writer and other lookers-on remarked that the day would come when these insults would be resented and revenge show itself in no unmistakable fashion. The Sahib will remain a Sahib so long as he shows himself to be a gentleman, but the traditions which declared to us that the natives must be thus treated to keep them in order is not true, and that a day of resentment, unless carefully handled, will come is as sure as the sun rises. When the Indians in 1914 resident in this country in the month of August applied at the various ambulance-teaching centres, military and civil, for training as orderlies at the three military hospitals being got together in this country by the Indian students they were refused, to the consternation of the India Office authorities. The writer was approached by the India Office and asked if he could do anything to help in the puzzle. He immediately said he would undertake the training, and proceeded forthwith to do so at the Polytechnic, Regent Street, and took them to Regent's Park to do open air drill. After the writer had taught them for six weeks, first a Lieutenant, then a Captain, and finally a Major

of the R.A.M.C. took them over from the writer, and the students, some 120 in number, were apportioned to the hospitals, and they served as orderlies in the wards during the time the Indian soldiers were resident on the south coast of England. The interesting thing is that Gandhi, since so notorious, was amongst these ambulance men. The dread was that he—and it was believed he had the power—might stop the huge Armada which was on its way between Bombay and Suez. Luckily the Government saw their way to take over the trained bearers before this possible catastrophe took place, and all was well.

The writer had another personal experience of how the sensitive natives of India were provoked by apparent neglect at home. This story is only known to a few. When Sir Frederick Lugard was on the West Coast, he believed that natives of the uncovenanted service in India would make useful members of the civil staff in West Africa. The result was that some twelve to eighteen of these men were brought from the north of India and landed on the West Coast. It seems by the time they arrived on the Coast Sir Frederick had left the Coast and gone to Hong-Kong as Governor. There was considerable delay in placing these men; reference had to be made to home, and the men were dissatisfied, more especially as the negroes on the Coast called them (the Indians) niggers and their presence was resented, as they were accused of coming to Africa and taking away their employment. The Indians got very dissatisfied, got lethargic, resented being asked to fulfil their contract under the circumstances. They clubbed their money together, and at their own expense came back to London. Luckily they were attended by the Reverend Shapurji Dadabhai Bhabha, M.D. Brux., L.R.F.P.S.Glas., L.S.A.Lond., 8, Drakefell Road, St. Catherine's Park, Nunhead, London, S.E.14, who brought one of the men of the Indian group to the writer's home for consultation. The writer then heard from Dr. Bhabha of the sad plight of these men, how some of them were in hospital, others ill in their lodging and all depressed, without money, and that their food was insufficient. On being asked why they had not applied for relief at the India Office, they said they had, but that they could not get past the porter at the door of the India Office. The writer asked Dr. Bhabha to come back on the following day at 5 p.m., and he would see what could be done. The writer asked friends to come and advise him what could be done. Amongst these were: Professor W. J. R. Simpson, C.M.G.; General Sir G. J. D. Evatt, K.C.B.; and Dr. Fletcher Little. Some ten or twelve of the Indians came to the writer's house at 5 p.m. At 5.15 the whole party in some six or seven cabs left Harley Street, went to the House of Commons, sent in cards to two Members of Parliament, Messrs. Cotton and Rees, who took the party to a private room in the House and arranged to present the Indians to the India Office. The end of the interview was as follows:—

(1) Money returned that was spent on passage home.

(2) All lodging accounts in London and other expenses paid.

(3) Tickets and travelling allowance paid for passage to Bombay.

(4) A substantial sum placed to their credit on reaching their home in the Punjab.

This story is given to show how misunderstandings bring about trouble between Europeans and natives, and to what serious complications these may give rise to where no slight is intended. The authorities said these were men of good position in India, and it was fortunate that the trouble which a porter caused when he told them to go away, "he would not have beggars hanging about the door." At the time dissension was rife and an outbreak feared in India. Luckily their "wrath" was abated by the kind treatment which they were given by the London authorities, but if the porter had continued to have had his way it might have been a different story.

It would appear that at one time there was an idea of allowing Indians to settle and possess land in Kenya; they wanted exclusive rights there, and still do so; but Sir F. Lugard does well to insist that the interest of the natives is the paramount consideration of settlement if the colony is to be established for the natives' good and not for the exploitation of outsiders, Indian or European.

Despite all criticism Sir F. Lugard remains unrepentant regarding his attitude towards Christian missions to Moslem States, and advocates the right of the Moslem ruler to vetc the entry of any Christian mission to his territory. The issue is complex, but it is difficult to refute the patient and sympathetic arguments adduced, however much the result may be regretted.

The man who will keep in his mind the attitude of tolerance for the natives in whatever colony he may find himself will be a blessing to the community he lives amongst; that gradually they will become advanced or be able to govern themselves and take their share of government along with the Europeans who have previously held sway.

J. CANTLIE.

Annotations.

Phenolphthalein Dermatitis (Samuel Ayres, Jr., M.D., *Journal of the American Medical Association*, vol. lxxvii, No. 2, November, 1921).—Most textbooks and most physicians regard phenolphthalein as a laxative which is entirely lacking in toxic properties. In seven of the author's cases an eruption of the skin was associated with the oral administration of phenolphthalein for laxative purposes. The eruption in four of the seven cases was of the same type, corresponding clinically, and in one case in which a biopsy was obtained, microscopically, to erythema perstans.

Studies on Agglutination with the Aid of the Centrifuge. The Influence of Temperature on Absorption and Flocculation (Frederick L. Gates, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 1, January, 1922).—The flocculation of bacteria which have absorbed specific agglutinins may be mechanically effected by means of the centrifuge, with results that coincide with those obtained by the standard method of test. Specific serological differences between meningococci, for example, may be determined by the centrifuge method. The technique is described. By the elimination of the inconstant time factor in the flocculation phase opportunity is given for a closer analysis of specific absorption, and of the influence of various conditions upon both phases of agglutination.

The velocity of the absorption reaction is a function of the temperature at which it occurs, and the acceleration with increasing temperature is of the order of chemical phenomena. The absorption reaction proceeds most rapidly near the temperature of antibody destruction. The injurious effect of high temperature is revealed first in the serum; the antigen-antibody complex is not less sensitive. The flocculation phase is also promoted by higher temperature, but lags far behind absorption, and consumes most of the time required for spontaneous agglutination.

The presence of an excess of antibodies greatly accelerates absorption and flocculation. The absorption reaction, under such circumstances, is ordinarily completed within a relatively short time.

The Elimination of Arsephenamin and Neoarsephenamin in the Urine. A Chemical and Clinical Study of the Abelin Reaction (B. B. Beeson, M.D., and P. G. Albrecht, B. C., Ph D., *Archives of Dermatology and Syphilology*, vol. v, No. 1, January, 1922). The authors are very much in favour of the Abelin test in cases of elimination, as it is readily and successfully applied for quantitative results without much difficulty or expense. The sensitiveness of the test is very great; it is only positive in the presence of arsephenamin and its derivatives, the quantity being approximately indicated by the colour of the ring. Other chemical substances of the benzine series which may be eliminated did not furnish any positive reactions. The elimination of arsephenamin and its derivatives by way of the urinary tract was slower in most of the cases than in Abelin's series. It was usually complete, or nearly so, within twenty-four hours after injection. A number of cases tested at later intervals gave uniformly negative findings.

Elimination seems to be due to the influence of a number of factors, among them (*a*) the dose injected; (*b*) the solvent employed; (*c*) previous treatment, especially by arsephenamin or its derivatives; (*d*) dietary indiscretion soon after treatment; and (*e*) the personal element. Elimination does not always proceed in a rhythmical manner.

Abstracts and Reprints.

THE PRESENT-DAY SOURCES OF COMMON SALT IN RELATION TO HEALTH, AND ESPECIALLY TO IODINE SCARCITY AND GOITRE.[1]

By Emery R. Hayhurst, M.D.

It is not the purpose of this paper to discuss the iodine theory or the use of iodine in the prevention of goitre and its associated conditions. These have been investigated for animals by such workers as Marine and Lenhart, Gaylord and Marsh, and others, and cover such animal life as fresh-water fishes, frogs, and domestic animals. The "hairless hog malady" and its association with goitre and deficiency of iodine in the diet was pointed out by Smith in Montana, and later by Hart and Steenbock of the University of Wisconsin, and Kalkus of Washington State Agricultural Experiment Station. Marine advocated the giving of sodium iodide with salt in the prevention of endemic sheep struma in the St. Clair Flats about Detroit, with happy results. Finally, the goitre prevention work of Marine and Kimball, by administration of sodium iodide to school children of Akron, Cleveland and Warren, Ohio, is confirmatory of the importance of iodine in goitrous conditions. In foci of severe endemic goitre sex plays little part.

The question of the significance of iodine in the prevention of goitre is left to the authorities cited, as is also the question of the observed scarcity of iodine in food for man and animals.

While iodine may occur in natural deposits along with chlorine, usually in the form of the sodium salt, it is never obtained from such sources commercially because it occurs in too limited quantities. Chili saltpetre is the chief source of iodine. The sea is the great storehouse of iodine, where it completes a cycle from inorganic compounds to organic life and return. The salts of sea water are constant both in quality and quantity. Sodium chlorides comprises 77·8 per cent., magnesium chloride 10·9 per cent., with many compounds, including sodium iodide, which composes the remaining 11·3 per cent. All of the salts in sea water are unusually soluble in plain water.

The great solubility of sodium iodide accounts for its almost complete absence from the land surface and, perhaps, for some of the peculiarities noted in regard to the incidence of goitre.

Authorities are agreed that goitre is infrequent in both animals and man along the sea. The same is true, also, of some fishes (salmons) which inhabit both fresh and sea water, tending to develop goitres in the former and none in the latter. Apparently sea animals do not have goitre. Practically all salt used in the United States for dietary purposes is

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxviii, No. 1, January, 1922.

obtained from inland sources by the evaporation of brines, which for the most part are inherently free of iodine. Irrespective of the source, whether sea water or inland deposits, the modern processes of preparing and purifying salt free it from all traces of iodine, as well as its other naturally associated elements, many of which are identical with the body fluids of higher animals.

Conclusion.—An analogy should be drawn from sea life and a precept taken from evolution. Of the dependable sources of iodine in nature—sea, air, sea food and sea water—it is to sea water used perhaps in place of common salt as a condiment that inland dwellers should look. This substitution would appear to offer a complete solution to the iodine deficiency problem, if nothing else, while evidence would show that other constituents of sea water have also an undoubted place in the economy of the higher animal organism, perhaps to the extent of precluding some diseases which are, likewise, of a deficiency type. Common salt for dietary purpose should include not only sodium chloride but also sodium iodide, and undoubtedly many of its other original concomitants. For geochemical reasons, great care should be taken in selecting its source if it is not actually derived always from sea water. It must then be handled commercially in a manner to retain these constituents.

MALARIAL FEVERS.[1]

By Captain R. W. Mendelson, M.R.C.

In Bangkok the conditions are ideal for the spread of practically all kinds of mosquito-born diseases, with special reference to malaria; yet the laity and even many of the medical men still maintain that "In Bangkok we have no paludism, only up-country do you find it."

In one of the charity hospitals under the supervision of the medical officer more than a thousand patients are treated monthly, both surgical and medical, and from a continuous and close observation it has been found very advisable to administer quinine to practically every case.

The great majority of all patients treated are from Bangkok proper, many of them never having been out of the city. A series of blood examinations at various times shows an average of 25 per cent. harbouring parasites in the peripheral circulation, and of these 10 per cent. are pernicious subtertian. It behoves one to make careful blood investigation.

Symptomatology.

The great majority of all cases are simple tertian and cause but little trouble, responding as a rule to oral therapy and running a short course. These cases have been relighted and started burning, as it were, by some inter-current accident, either medical or surgical—as a rule, surgical. From a symptomatic standpoint there is nothing of interest in this type of case. It simply goes to show that, contrary to the general opinion harboured by many people living in a malarious country that there is no danger, it is really necessary to constantly practise the principles of preventive medicine with the greatest energy and zeal.

The following three cases are reported for two reasons: First, to show that a pernicious type of malaria is present; and, second, to illustrate the localization of the parasite in this type of the disease.

Subtertian fever depends for its symptoms upon *Laverania malariæ*. The infection may be typical, in which case the diagnosis is not so difficult, because the parasite is much easier to demonstrate in the peripheral circulation and the temperature chart is more or less typical. On the other hand, the infection may be atypical, in which case the problem is an entirely different one. This is so for the reason that the subtertian parasite can pass its entire life-history in the internal organs, and very often does. As a result any organ or system of the body may become the special target of the infection, and in turn any disease, acute or chronic, may be imitated. Therefore, a negative blood is without value.

The classification of typical subtertian fevers is simple compared to the classification of atypical ones. Under the first we may have the following: (1) Simple subtertian; (2) double subtertian; (3) mixed subtertian. Under the second we have subtertian with localization and without localization. The cases without localization may resemble acute infectious disease, acute intoxication, or other obscure physiologic derangement. The cases with localization are too numerous to specify, but may be arranged according to system or organ, such as nervous, digestive, ductless gland, &c.

Case No. 1.—On October 1, 1920, an Indian appeared in the out-patient department of the hospital for treatment. He had just arrived in the city, having walked overland from Burma. His previous history was negative in so far as it could be accounted for. His present history was not enlightening. He complained of fever, but no chills, and said he felt sick all over. Physical examination revealed a fairly well preserved body with no abnormalities. The spleen was not enlarged. Patient put to bed. Urine examination negative. Blood examination negative for hæmamœba or signs of same. White count, 12,000. Patient not doing well; restless. Temperature irregular. Treatment expectant, with quinine gr. 10 t.i.d. Second day patient comatose, and on the morning of the third day died. Continuous blood examination failed to show parasites. The post-mortem examination was practically negative except for severe congestion of the brain. The spleen was quite normal in appearance. It is interesting to note that blood taken from the

[1] Abstracted from the *Military Surgeon*, vol. xlviii, No. 5, May, 1921.

cerebral capillaries was fairly loaded with subtertian parasites.

Case No. 2.—A Bangkok-born Chinese, aged 21, appeared in the out-patient department of the hospital for treatment, having been carried to the hospital by his friends. He was at once put to bed, and examination revealed the following: The patient presented evidence of severe hyperæsthesia. There was a slight convergent strabismus. It could not be ascertained whether this was present previous to his illness or not, as the patient was quite delirious, and his friends seemed quite ignorant of any previous history. There was severe rigidity of the neck; the patient could quite easily be lifted from the bed by exerting pressure on the back of the head. Kernig's sign present and marked. Spleen quite normal in so far as examination was possible. Other physical examination negative. Provisional diagnosis of meningitis of unknown etiology. A blood examination made at once showed a white count of 8,000. A slide showed a marked subtertian infection. Specific treatment resulted in complete recovery in forty-eight hours, the patient refusing to remain longer in the hospital, stating that he was not sick.

Case No. 3.—A native Siamese, born and raised in the city of Bangkok, aged about 30, arrived, assisted by his friends, in the out-patient department of the hospital for treatment. A physical examination revealed a well-marked polyneuritis of the lower extremities of quite recent development. No œdema. Spleen and liver normal, other physical examination negative. Patient seemingly quite rational, but unable to answer questions intelligently, with special reference to his present illness. His immediate past history seemed very vague in his memory, and a more intensive mental examination, combined with his motor polyneuritis, led to the diagnosis "malarial psychopolyneuritis, Korsakoff in type." The patient was put to bed, and a blood examination showed a white count of 9,000. Slide negative for hæmamœba or signs of the same. Patient given urgent anti-malarial treatment, combined with anti-beriberi therapy, and made an uneventful and complete recovery in four days.

Treatment.

Nothing new can be added regarding the treatment. Satisfactory results are obtained in the native by the proper use of quinine without recourse to the more recent specifics such as the organic compounds of arsenic and others. This is not always the case in the white man who has been in the country some time and has been doping himself more or less continuously with quinine. Seemingly the native is virgin ground for quinine the same as the white man is for the parasite. In conclusion, suffice it to state that it always pays to treat every patient as suffering from malaria until the said patient has left the confines of the hospital. This is a dogmatic statement, but will be appreciated by medical men working in a malarious country.

NON-SPECIFIC PROTEIN THERAPY IN ARTHRITIS AND INFECTIONS. REMARKS ON THE NATURE OF THE CLINICAL REACTION.[1]

By David Murray Cowie, M.D.

The effects of foreign protein in typhoid fever have been observed for over twenty years. There is no question that in quite a large per cent. of these cases the disease can be aborted or its course shortened, or made less severe. We also know that in a number of cases of pneumonia and influenzal pneumonia, if the injections are given early, the temperature is permanently reduced, and the process in the chest favourably influenced. I have observed a similar drop in the temperature curve of scarlet fever, and in erysipelas, with a temporary disappearance of the rash, but there was no permanent improvement. I have gathered together a short series of cases which, in themselves, are too few in number to base any absolute opinions on; but which are sufficient in kind and nature to be of some assistance in the study of our problem, and I am quite sure of the final result in these cases. It will be seen that suppurative foci, furunculosis, gonorrhœal vaginitis, suppurating mastoiditis, may be definitely influenced by foreign protein when other methods of treatment have failed. Most striking of all are the effects on conditions in the eye—iritis, panophthalmitis uveitis, pneumococcus corneal ulcers, hypopyon ulcer, granulomatous hæmotoma due to hæmolytic streptococcus. These conditions can be carefully and skilfully observed by the trained ophthalmologist that they seem of particular interest. For example, the process in the iris could be watched during and after each injection, and the progressive changes for the better could be almost measured from day to day. It will be seen that even processes of long standing, in this locality, are quickly affected by the foreign protein injections, as, for example, the pronounced granulomatous case of two years' duration. Some, if not all, of these cases may have been previously reported by Professor Parker, who referred them to us for treatment.

Next come the cases of chorea, which are considered in conjunction with arthritis, because of their frequent association and the ætiology, which seems to be the same. I have recorded thirteen cases of chorea, varying from three weeks to seven years in duration—that is, frequent attacks extending over a period of seven years. There are included in this series chorea major, chorea minor, and hæmichorea. There is unquestioned immediate improvement in twelve of these cases—92 per cent. That is, patients seemed better and movements were less marked after the reaction was over. The movements were aggravated after the reactions in one case. Temporary improvement occurred in three. Permanent improvement, or

[1] Abstracted from the *New York State Journal of Medicine*, vol. xxi, No. 11, November, 1922.

what we might term a cure of the attack, occurred in eight, or 61 per cent. There was no improvement in three cases. By permanent improvement we mean the attack was definitely stopped. Some of these cases may have had recurrences, the knowledge of which has not been ascertained, excepting in Case 9, which recurred two months later, and was cured by an attack of measles. In this disease the question always presents itself: What would have happened had we left the patient alone under favourable conditions of quiet, rest and food? And whether our primary rest period, which in some cases extended over many days, prior to the foreign protein treatment, did not have a definite influence, and the patient got well in the balance of time, in spite of the injections and because of a continuance of favourable conditions? We can, however, say definitely that very frequently a pronounced beneficial effect is produced. For example, one of the chorea major cases, when shown in the clinic, had to be tightly bound to the stretcher with a sheet, and when released it was difficult to hold him on the table for observation. This condition continued until a foreign protein was given, after which he became quiet. On the next clinic day, which occurred a week later, he was wheeled in as other patients are, almost perfectly motionless. Nearly as striking, however, is the opposite effect when absolutely no impression is made by the use of foreign protein. When we analyse these cases further, we find that for the greater part it is the long-standing cases that showed no improvement. Case 14 is a marked exception.

To this group of chorea cases I have added three that developed measles during the chorea. They did not receive foreign protein treatment for the attack. After the measles was full-blown, the chorea stopped and did not return. Here we have an illustration of the effect of an acute process on a subacute and chronic disease, which possibly is not at all comparable with the acute process initiated by the foreign protein.

Last we come to a group of arthritis cases. What do we mean by that broad term when we talk about these cases collectively? Does the term mean as much to us as the term rheumatism which we have all been trying to discard? How are you going to class the rheumatic who shows no definite structural lesions? Yourself, for example, you are active to-day; you sit in a draught, you get your feet wet, or you have unwittingly suffered exposure. Very soon after this you become stiff in your muscles, in your spine, in your neck, fingers, joints, or extremities. This condition may last for a day or two and of itself go away, or it may recur and persist and be relieved by a salicylate, a hot bath, or an intravenous injection of foreign protein. Can we call this condition arthritis? Then, again, in typical arthritis, showing anatomical deformity in the soft or bony structures, the patients are often comfortable so far as pain is concerned, but on certain days or at certain times they will tell you: "Doctor, I have rheumatism to-day." We all know what it means. There is a group of cases with this predominant symptom without definite structural changes which we feel is benefited greatly by foreign protein therapy. These patients may also be benefited by something else, but we are interested in knowing why they are benefited by foreign protein, and not in popularizing the method of treatment, which is often very distressing and hard to bear. These cases have to be classed with the acute or subacute arthritis cases, their chief symptom being rheumatism.

Next come the cases of acute rheumatic fever, acute articular rheumatism, with swelling, heat, redness, perhaps fever, migration and cardiac complications. Of these I have treated but few with foreign protein. I have personal records of cases, in the hands of others whose judgment I trust, in which definite benefit came from foreign protein therapy. They are different from a similar process in children, which goes on progressively from bad to worse, resulting in marked deformity and permanent invalidism. These cases are characterized by swelling, pain, fever often of long duration and recurring, migration, enlargement of the spleen, and lymph nodes; a definite deforming arthritis, with conspicuous absence of cardiac lesions and bone changes, resisting all methods of treatment yet proposed, even if taken in the earliest stages—Still's disease.

The subacute or milder chronic cases in my hands, the ones I have seen the most improvement in, are very satisfactorily managed by this method of treatment. The element of uncertainty is present here, and for that reason I feel that the surer way of a cure, that of the removal of surgical foci, should first be tried. The valuable reports of Pemberton and his associates should be carefully studied by all who are interested in the cure of arthritis patients. It is of interest to note that in this series of 250 cases there was a considerable percentage (26·75) in which no discoverable foci could be found. This is a group in which foreign protein therapy could be used very legitimately.

As a focus of infection not so frequently thought of, perhaps not so frequently a factor in arthritis, we should consider the gall-bladder. This fact was brought to my attention in an entirely unconscious way. I had made the diagnosis of gall-bladder disease in a woman of 52 years. I was studying the bile samples by draining after the Meltzer method. After the third drainage the patient informed the nurse that she could move her great toe, and that it was more flexible than the other. Then I found out for the first time, that for three years she had tried many measures to get her toe from what had been considered an ankylosed condition. It is now four months and there is no recurrence. Another case examined the same way is a woman of 60, a music teacher. After the first drainage, and particularly after the second, she volunteered the information that the treatment had made her fingers limber and that the stiffness had left her feet. She could now play more easily.

Her gall-bladder symptoms had overshadowed the symptoms of arthritis, of which she made no complaint or showed no evidence during examination. There was just the feeling of stiffness and clumsiness which was now relieved.

Not until after all foci of infection have been carefully considered should we think of the advisability of using foreign protein therapy. One might argue because of the effect on local infectious foci, as those of the eyes and ears and skin, foreign protein might in itself clear up an infectious focus, but the best practice is to eliminate a known focus first.

We learn from the clinic that it is the acute local processes that are benefited most. This, we think, also supplies the typhoid fever which we now consider a local disease. The work of Teague and McWilliams and that of Rouse furnishes quite convincing evidence that typhoid is not a septicæmia in the true sense of the term, but a local disease of the lymphatic system. Pneumonia is also benefited in the early stages, at least by the influence of something we think determines, or mobilizes, the mechanism of defence to the affected part.

It will be further noticed that those parts to which there is a free blood supply are the ones that are most likely to be benefited by foreign protein therapy. So the time and place have much to do with deciding our choice of procedure in the use of foreign protein in infectious processes.

Dosage.—We have probably uniformly employed larger doses of killed typhoid bacilli than most physicians. We seldom use a dose under 500,000,000, and children, as well as adults, have received billion doses. Our reactions are usually sharp, and include the unpleasant symptoms of nausea, headache, and sometimes vomiting. There has never been an untoward result. However, the work of others with smaller doses seems to show equally as good results as ours. That being the case, the smaller dose should be the one of choice. Foreign protein should never be used indiscriminately. I personally feel it is major medicine, and should be carried on as any major affair is; the best of nursing is the best preparation possible for the patient's comfort, and due reference to his actual status from the standpoint of disturbed physiology and metabolism. A careful explanation of what is going to happen should be explained to the patient. It is surprising how "rheumatic" people will be anxious for a repeated rose of foreign protein. I think it would be perfectly safe to fix the average dose for child or adult at 100,000,000 dead typhoid bacilli and the maximum at 500,000,000. Succeeding doses may have to be increased in certain individuals and in certain types of cases. There may be found a failure of response, and a gradual decrease in the clinical reaction with the same dose. On the other hand, a marked clinical reaction may occur with the same size dose and a definite decrease take place in the blood reaction. Some have attributed the beneficial effects of foreign protein to the hyperthermia produced. This is still an open question.

Fear has been expressed that the foreign protein reaction might bring about bone marrow exhaustion in infectious diseases. Nagao (*Journal of Infectious Diseases*, 1920, vol. xxvii, p. 327) is of the opinion that the appearance of immature leucocytes indicates exhaustion of the leucocytogenic centres. It might be of interest in this connection to record a case of severe anæmia in an infant one year old in which a diagnosis of a plastic anæmia had been made, but which we could not confirm. The blood picture frequently showed the polynuclears between 4 and 20 per cent. No improvement followed transfusion. There was an increase in cells which could be attributed to the cells added. Intravenous dead typhoid bacilli brought a quick response to 78 per cent. leucocytes, and thereafter the blood condition improved rapidly. The suggested possibility of bone marrow exhaustion should make us still more conservative in selecting suitable cases for this form of treatment.

The whole subject of non-specific protein reaction is bristling with interest. Those induced by the body itself; those induced by substances we introduce into the body; and those induced by the destruction of abnormal tissues in the body by means of external means, such as X-ray. It is only possible in the allotted time to give a general view.

A SIMPLE PROCEDURE FOR AVOIDING ANAPHYLACTIC SHOCK.[1]

By T. L. Stedman.

Anaphylactic shock can be avoided, as Roux, Besredka, Banzhof, and Fumulener have shown experimentally, by inducing hypnosis before the injection is given, by means of chloralose, chloral, or urethane. More recently still, Kopaczewski and the Roffos have noted that it was possible to prevent the production of acute anaphylactic accidents by means of ethereal solutions without going to the extent of producing anæsthesia, and these observers have attributed the preventive properties of all these substances to a common physical character they present—namely, that of decreasing the surface tension of the serum. They came to the conclusion that in the future all influence of the nervous system that has been supposed to exist in the genesis of anaphylactic shock is to be discarded, as this phenomenon depends principally on a reaction of colloidal flocculation and asphyxia correlated to occlusion of the capillary networks by aggregations of micellæ. Although regarding with reserve the part that these observers attribute to surface tension in the production of anaphylactic shock, Lumiere and others have for a time suspected that the serum injection provoked the formation of a precipitate in the blood plasma which might be the initial cause of the phenomena observed.

[1] **Abstracted from the *Medical Record*, vol. xcix, No. 16, April, 1921.**

This explanation is in accord with the well-known fact that when an animal is prepared by the injection of foreign albuminoid matter its serum at the end of a few weeks acquires the property of producing flocculation in the solution of albumin employed. It is therefore logical to suppose that the hæmoclastic paroxysm induced by the secondary injection of this same albuminoid matter in the prepared animal is attributable to the formation in the blood of a precipitate susceptible of profoundly disturbing the capillary circulation. Richet, by injecting an untreated animal with the blood mixture of sensitized animal and the substance giving rise to the paroxysm, obtained the usual results. Briot, Friedberger, Friedmann, and several others have also provoked anaphylactic shock by treating normal animals with mixtures of sera reacting on each other and giving rise to flocculation.

In order to verify the above hypothesis, Lumiere and Chevrotier have carried out a series of experiments with the attempt to discover the chemical combination capable of preventing the production of this flocculation. They injected sheep's serum into an ass in small but repeated doses, and forty days after the last injection the ass was bled and the serum obtained was distributed in tubes to which various substances, including sheep's, had been added in order to determine those which prevented mutual precipitation of the sera. Contrary to what they expected, these observers found only a very few reagents susceptible of fulfilling this condition, the precipitate being remarkably insoluble in almost all the bodies essayed, and of those which they thought would be the best—sodium sulphocyanide, sodium ethylosulphate, and sodium hyposulphite—had not the power of absolutely preventing all precipitation.

On account of its low toxicity, sodium hyposulphite appeared to be the best of all for the prevention of anaphylactic shock, and in order to be assured of the exactitude of this supposition these observers prepared two lots of guinea-pigs by injecting into each 1/500 c.c. of normal sheep's serum. Thirty days later the animals composing one lot being taken as control animals were given an intracardiac injection of ½ c.c. of the same serum to which was added ½ c.c. of an 8:1000 isotonic solution of sodium chloride. Without an exception they all died in one or two minutes, after presenting paralysis of the hind legs and convulsions. In the animals comprising the second lot prepared in the same way, the NaCl solution was replaced by the same volume of a 5 per cent. solution of sodium hyposulphite, and it was found that no anaphylactic accident occurred. The serum in the dose which had produced shock in the control animals gave rise to no symptom. The same experiments were repeated with antidiphtheritic serum and gave exactly the same results. Sodium hyposulphite does not appear to destroy or even attenuate the properties of the antitoxic sera, and these observers are now undertaking experiments to ascertain the influence of a prolonged contact of these bodies, with the object of demonstrating that no ill-result onsues from the use of such mixtures. They point out that they have not yet determined the action of sodium hyposulphite as far as late anaphylactic accidents or secondary serological effects are concerned, but from the results so far obtained they maintain that we now have a simple and entirely safe means of preventing anaphylactic shock.

Medical News.

Royal Society of Tropical Medicine and Hygiene.—A Laboratory Meeting of the Society was held at the Royal Army Medical College, Grosvenor Road, S.W.1., on Thursday, March 16, at 8.15 p.m., when the following demonstrations, amongst others, were given:

Lieut.-Col. H. Marrian Perry: The Dreyer and Ward Modification of the Sachs-Georgi Reaction applied to the Diagnosis of Frambœsia. Lieut.-Col. W. P. MacArthur: Some Anthropods of Medical Interest. Major J. A. Manifold: Agglutination Response following Inoculation of a Polyvalent Vaccine, consisting of *B. typhosus*, *B. paratyphosus* A, B, and C. Major S. Elliott: Water Purification—Demonstration of Bleaching Powders suitable for Tropical Use. Lieut.-Col. Clayton Lane: Mass Diagnosis in Ankylostomiasis, and Some Little Recognized Features in Common Helminths. Major H. C. Brown: Phenol Red—an indicator in culture media. Dr. H. M. Woodcock: Intracellular Bodies arising from Hæmatophagy. Dr. A. C. Stevenson: Negri-like Bodies in Cells of the Sheep-ked. Prof. L. S. Dudgeon: Condition of the Eye in Malaria. Major F. W. Cragg: Method of Fertilization in the Bed-bug. Dr. P. C. W. Laws: Multiple Infection of Red Cells in Benign Tertian Malaria. Dr. J. Anderson: Pathology of Filariasis. Dr. W. E. Haworth: A Native Method of Vaccination against Small-pox. Capt. H. E. Cross: A Collection of Indian Tabanidæ.

During the course of the evening Prof. R. T. Leiper showed a cinematograph film entitled "Unhooking the Hookworm."

Tropical Hygiene.—The importance of hygiene in tropical and sub-tropical countries has for long been recognized, and in addition to the general duties of a sanitary inspector many subjects require special consideration and study. The Council of the Royal Sanitary Institute have recently established an Examination in Tropical Hygiene for Inspectors, the syllabus of which has been carefully prepared to cover the special duties, including mosquitoes, sanitation of native quarters, tropical conditions on health, tropical diseases, &c., and has received the general approval of the Colonial Office and the London School of Tropical Medicine.

Original Communications.

ON THE HATCHING AND MIGRATION IN A MAMMALIAN HOST OF LARVÆ OF ASCARIDS NORMALLY PARASITIC IN COLD-BLOODED VERTEBRATES.

By R. J. Ortlepp, M.A.

Helminthological Department, London School of Tropical Medicine.

Stewart (1917) was the first to show that when embryonated ascarid eggs are fed to a suitable animal and the contained embryos are liberated in the intestine, the larvæ do not remain in the intestine. He found that within twenty-four hours of feeding to mice and rats the larvæ could be found in the liver, and within the next twenty-four hours in the lungs. From his results he concluded that ascarid larvæ normally travel to these organs, reaching them either *via* the mesenteric and portal veins or *via* the bile duct. The former course he considered the more probable. From the liver he assumed the larvæ pass *via* the hepatic veins into the heart, and from there to the lungs. In the lungs the larvæ grow in size, but before attaining maturity pass into the bronchi, travel up the trachea and down the œsophagus, eventually reaching the intestine where in a normal host they attain sexual maturity.

Yoshida (1919) experimenting on guinea-pigs found ascarid larvæ, after ingestion of embryonated eggs, in the abdominal cavity, spleen and pleural sacs. From his observations he puts forward the hypothesis that the larvæ, in order to reach the lungs, perform active migratory movements, boring through any organs interposed between them and the lungs.

Ransom and Cram (1921) showed that the migration of ascarid larvæ was *via* the blood-stream, and that their active penetrative movements were limited to the piercing of the mucous membrane of the intestine and the hepatic cells separating the branches of the portal and hepatic veins. In no cases were they able to find larvæ within the bile duct. These workers were thus able to support Stewart's views. Further, they showed that the larvæ are carried into the right ventricle and from there are pumped to the lungs.

That ascarid larvæ, before reaching maturity, have to pass through the liver and lungs of the host, seems to be fairly well established. This has now been demonstrated for *Ascaris lumbricoides*, from man and pig, for *Belascaris* and *Toxascaris* spp.

From the fact that they found ascarid larvæ in the lungs of the python Ransom and Foster (1920) suggested that this was probably also the case for *Polydelphis anoura*. Recently the writer has obtained immature ascarids in the lungs of an Indian python —*Python molurus*—which died in the gardens of the Zoological Society of London. Shortly after he was able to collect from two diamond pythons—*P. spilotes* —mature females of *Ophidascaris filaria* and *Polydelphis attenuata*. With the embryonated eggs from this material Dr. Goodey performed experiments to determine the fate of the larvæ after ingestion. Unfortunately no suitable reptilian host was available for experiment, consequently mice were used.[1]

Two full grown mice were procured; one was fed with embryonated eggs of *P. attenuata*, while the other was fed with similar eggs of *O. filaria*. An hour later the former mouse was also fed with numerous ensheathed and active larvæ of *P. attenuata* which had been obtained from a culture of eggs allowed to become dry and then remoistened. Two hours after feeding free larvæ were observed in the fæces of both mice. The fæces, which up to the time of feeding were normal, were now diarrhœic. Next morning the mouse fed with eggs of *O. filaria* was dead, while the other mouse did not appear well. From the intestine and cæcum of the dead mouse numerous unhatched eggs, empty shells and active larvæ were recovered, but none were observed in press preparation of the liver and lungs which externally appeared normal. In sections of portions of the intestine, examined microscopically, no larvæ were found to have penetrated the mucous membrane.

In the fæces of the still living mouse empty eggs, free larvæ and unhatched eggs were seen. On the following day the fæces were again examined, and this time only a few empty egg shells were found. The mouse still appeared unwell and the fæces were still diarrhœic.

At 4 p.m. of the same day, i.e., forty-eight hours after feeding, the mouse was killed, and the blood, liver, lungs and digestive tract were examined with the results recorded below.

Blood.—As much blood as possible was collected by means of a hypodermic syringe from (1) the heart, and (2) the portal veins. Each sample was diluted with an equal volume of a 2 per cent. sodium citrate solution in order to prevent its coagulation. Each was then centrifugalized and the deposit microscopically examined, but no larvæ were seen.

Liver.—Externally the liver was dotted all over with white spots about the size of a pin's head. On teasing up a small piece of it and examining between two slides on a microscope, numerous larvæ were seen, in one field of the low power (⅔ in.) objective as many as two dozen larvæ were counted. In the tissue of the liver the larvæ performed only very slight movements, whereas those which had been liberated from it were quite active. The larvæ were of the same size as those newly hatched, but had lost their sheaths.

In sections of fixed liver material the larvæ were in most cases seen to be lying among the liver cells. Two larvæ, however, were observed in the portal veins, and one of these had penetrated the vein and was lying partly among the hepatic cells. Around each larva a considerable round cell infiltration had taken place, and this probably gave rise to the white areas seen externally.

Lungs.—Superficially the lungs had bright red spots dotted over their surface; these, on being

[1] I am indebted to Dr. Goodey for permission to give my observations on the results of his experiments.

sectioned, were found to be due to congestion of the lobules. In pressing a piece of lung, about 5 cm. square, between two large slides and examining on the microscope living larvæ were observed. In this piece of lung there were about three dozen larvæ which were all alive but only slightly motile; all had, however, shed their sheaths.

Some of the larvæ were isolated from the lung and compared with newly hatched larvæ; there appeared to be no difference between them anatomically except that the former were slightly larger, measuring on an average about 540 μ long, whereas the latter were just under 500 μ long.

A piece of the lung was fixed in hot Schaudinn's solution, and serial sections were cut from it. In these sections it was seen that some larvæ were lodged in the alveoli, while the rest were in the lung tissue.

Scrapings taken from the bronchi and trachea revealed no larvæ.

Digestive Tract.—The œsophagus and stomach appeared normal, and scrapings from their inner surface revealed no larvæ. The duodenum and small intestine were much inflamed and their mucous membrane was coated with a creamy pus-like layer. Scrapings from both showed no larvæ or eggs. The cæcum and rectum appeared normal and from their contents a few eggs and empty shells were recovered.

From the above results it would appear that Ransom and Foster's view as to the migratory course of ophidian ascarid larvæ was correct. Although it was not possible to determine the actual course to the lungs taken by the larvæ, yet it is highly probable that it is the same as that of *A. lumbricoides*, namely via the blood-stream. The finding of a larva in the liver which was partly in and partly out of a portal vein seems to support this view, despite the fact that no larvæ were recovered from the blood. Unfortunately no further experiments to prove this could be undertaken because of the lack of material.

The fact that these results could be obtained in a warm-blooded animal where the normal host is a cold-blooded vertebrate, is very interesting, and tends to show that ascarid larvæ will undergo partial development in, and produce harmful effects on a host which is only very distantly related to the normal host.

Sambon (1907) recorded the finding of immature ascarids, in all stages of development, either free in the body cavity or encysted on the surface of the liver, stomach and spleen of puff adders—*Bitis arietans*—and nose-horned vipers—*B. nasicornis*. He therefore suggested that this parasite reaches the lumen of the intestine by successive migrations through the viscera. In all the pythons dissected by the writer no larvæ-containing cysts were found, neither were any ascarids found free in the body cavity. As has been already stated, he did, however, find immature ascarids in the lungs varying in length from about 4 cm. to 10 cm.

Fülleborn (1921-1922) in some experiments with embryonated eggs of Belascaris and Toxascaris, found the encysted larvæ of these parasites in various organs of his experimental animals which had been fed with their eggs. These larvæ had undergone no development. He was further able to show that these larvæ, when fed to another animal, would become released from their cysts in the intestine, and would then behave in the same way as larvæ which have just hatched. He thinks that the larvæ are carried to the various organs, in which they become encysted, by the systemic circulation from the lungs, and not by active penetration of the various organs. He was able to support his views by an ingenious experiment. He covered the kidney of his experimental animal with a rubber bag through which ascarid larvæ could not penetrate; only the hilus region—containing the blood-vessels—was left free. After feeding this animal with ascarid eggs he found larvæ in the kidney, thus showing that they had travelled to it via the blood-stream, seeing that all other ways of reaching it had been excluded.

In view of Fülleborn's observations, the encysted larvæ observed by Sambon may have been carried from the lungs to the various organs by the systemic circulation. It is, however, interesting to note that the encysted larvæ seen by Sambon were in all stages of development, whereas the larvæ found by Fülleborn had undergone no development. Should Sambon's observations prove to be of normal occurrence in ophidian ascarids, one would have to modify one's views as to the migratory course of ascarid larvæ, because it would appear that, in addition to the lungs, these larvæ can pass to other organs of the body and there undergo part of their development. This raises an interesting point as to how these larvæ reach the lumen of the intestine in order to reach sexual maturity. The results of a Japanese worker, Asada—cited by Fülleborn, 1922—may perhaps throw some light on this problem. He (Asada) claims to have been able to get ascarid larvæ to penetrate the intact skin of rats, mice and guinea pigs. Fülleborn—if the writer understands correctly—also seems to incline to the view that ascarid larvæ may be able to penetrate the intact skin. The writer, however, experimenting with ensheathed larvæ of *P. attenuata* was unable to obtain any evidence of their penetration of intact skin obtained from a very young rat (Goodey's method), although the larvæ were allowed to remain on the skin in a drop of water at 30° C. and 37° C. long enough to allow them to penetrate it.

Observations on the Eggs and Larvæ.

The eggs of both these parasites are very similar in appearance and size, being roughly spherical or slightly oval, measuring on an average about 76 μ in diameter. They possess a thick shell which externally is ornamented by a considerable number of small protuberances; these in *O. filaria* appear to be slightly coarser than those of *P. attenuata*. At the time of laying—and also in the uterus—the eggs have already commenced to segment, and freshly laid eggs were seen to be either in the 8- or 16-celled stage.

At the temperature of incubation, 22° C., fully developed and ensheathed embryos appeared on the

tenth day, and on the twelfth the great majority of embryos were in this condition. The appearance of the first cuticle was noticed seven days after commencement of incubation. No ecdysis was observed within the egg prior to ensheathment.

The mature embryo forms within the egg shell slightly more than two coils, and almost fills up the whole of the shell space; it is closely invested by the vitelline membrane.

Some of the ensheathed embryos were liberated from their shells by cracking the eggs under a cover slip, and then killed by gentle warming. The outstretched embryos thus obtained were of the filariform type, tapering slightly towards both extremities, and about 0·49 mm. long by 28 μ broad in the middle of the body. The œsophagus is simple, slightly thicker behind and measures about 130 μ long and 10 μ broad at its base. The mouth leads directly into it by a somewhat circular opening. The nerve ring is situated just in front of the middle of the œsophagus, and immediately behind it is the excretory pore. The intestine, which measures about 270 μ long is very granular, and the number of cells which compose it could not be determined; on its ventral aspect, about 100 μ in front of the anus, is situated the lens-shaped genital rudiment. The tail is short, about 60 μ long, and terminates in a fine point.

In order to determine the effects of drying on the embryos a culture of eggs from each parasite was allowed to dry at ordinary room temperature—about 20° C.—and to remain dry for twenty-four hours. Tap water was then added to each. On re-examination twenty-four hours later it was observed that the larvæ were all still alive, and that in one culture—*P. attenuata*—a number of larvæ had hatched and were swimming about actively in the water; in the other culture—*O. filaria*—four free larvæ were observed. The larvæ were now separated from the eggs and the latter again allowed to dry; this time they remained dry for five days. After the addition of tap water, incubating for twenty-four hours, and subsequent examination, it was found that numerous larvæ were present in the egg culture of *P. attenuata*. In the culture of *O. filaria* eggs many larvæ were also observed, but these were not so numerous as in the former culture. All the larvæ in both cultures were ensheathed. Cultures of eggs of both these parasites, which had not been allowed to dry, showed no free larvæ twenty days after the eggs had become embryonated.

The above experiments seem to show that the embryonated eggs of these parasites can withstand dryness for prolonged periods without harmful effects being produced on the embryos. They also seem to show that drying has some effect on the subsequent hatching of the embryos. As to why this is so the writer cannot definitely say, but suggests that drying may be a desirable prelude to the eggs being swallowed by the host, because in the remoistened eggs the egg shell was observed to be very much thinner than in those eggs which had not been subjected to dryness. This thinning of the egg shell may possibly be brought about by the chemical action of secretions produced by the larvæ, these secretions being only brought to activity when moisture is taken into the egg after drying.

The actual hatching of the embryo was observed under the microscope. Prior to hatching the embryo moves about from side to side inside the now very thin and elastic shell: with its head end it pushes the shell out and so stretches it: this process is continued until some spot weak enough is found where the head forces its way to the exterior to be soon followed by the rest of the larva. The larva thus liberated is still ensheathed.

The effects of heat on the ensheathed larvæ were also observed. A number of larvæ in a little water were placed on a glass slide contained in an electric heating frame, placed on the stage of the microscope. At the commencement of the experiment almost all the larvæ were active, a few, however, were motionless and coiled. The effects of rising temperature on the larvæ were as follows:—

72° F. Most larvæ moving, 10 coiled.
74° F. Three coiled larvæ beginning to uncoil.
76° F. No change.
78° F. Larvæ slightly more active.
80° F. Slightly increased activity.
82° F. ,, ,,
84° F. Larvæ more active.
86° F. Twenty larvæ very active, a few are sluggish.
88° F. A few active larvæ are performing jerky movements from side to side.
90° F. All the active larvæ are performing very jerky movements.
92° F. Similar. The coiled larvæ are possibly too weak, and show only slight shaky movements.
94° F. Similar.
96° F. Jerky movements very pronounced.

From the above record it will be seen that increased heat up to 86° F. has a stimulating effect on the activity of the larvæ, after that increase in temperature appears harmful. As the heating stage used does not increase in temperature beyond 96° F., it was not possible to determine at what temperature the larvæ are killed.

In order to find out whether these larvæ were able to penetrate the skin, twenty active larvæ of each parasite were placed in a drop of water on a piece of skin removed from the ventral surface of a very young rat; this skin had been stretched and pinned over a hollow cork suspended in normal saline which had been warmed to 30 °C. (Goodey's method). For the first five minutes the larvæ were watched under the microscope, and then again every five minutes for the next half hour; no attempts at penetration were seen. The whole was now placed in an incubator (37° C.) and on examination after half an hour some of the larvæ were seen to have coiled up and lie motionless on the skin; after another half an hour the majority of the larvæ had coiled. They were then allowed to remain in the incubator overnight. Next morning the drop of water on the skin had dried, but the larvæ could be seen lying coiled on the surface. By flooding the skin with water it was possible to pick up all the larvæ with a fine pipette, showing that no larvæ had penetrated it

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A BRIEF NOTE ON *VIBRIOTHRIX ZEYLANICA* (CASTELLANI, 1904).

By Igino Iacono, M.D.

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Carrying out the bacterial investigation of the stools of a bacillary-dysentery patient recently in Naples, I have isolated, in addition to a strain of Shiga-Kruse bacillus, a peculiar pleomorphic germ with all the characteristics of the organism described by Castellani under the name of *Vibriothrix zeylanica (Spiro-bacillus, Vibrio-zeylanicus)*. This organism has been recently investigated by Spagnolo and Russo and myself, and very thoroughly by Frank E. Taylor and Anigstein. In the plates made with Drigalski-Conradi agar, MacConkey and Endo, numerous colonies were seen similar to those of germs of the group typhoid-paratyphoid-dysentery. These colonies were further investigated, and the organism was sub-cultured in various media, sugar-broths, milk, &c.

Agar.—The growth on agar-slopes is somewhat similar to the germs of the typhoid-dysentery group; it forms a rather delicate film of greyish-white colour on the surface of the medium.

Gelatine.—Not liquefied.

Serum.—Not liquefied.

MacConkey Medium.—The colonies are white and resemble those of the dysentery bacilli.

Litmus Milk.—No coagulation of the medium took place. After a time it became alkaline.

Glucose Broth.—No production of acid or gas; after a time strong alkalinity. Pellicle was present.

Maltose Broth.—Same as glucose broth.

Saccharose Broth.—Same as glucose broth.

Dulcite Broth.—Same as glucose broth.

Galactose Broth.—Same as glucose broth.

Inulin Broth.—Same as glucose broth.

Dextrin Broth.—Same as glucose broth.

Lactose Broth.—Same as glucose broth.

Mannite Broth.—Same as glucose broth.

Indol.—Negative.

Morphological Characters of the Organism.—The germ is motile and appears under very different forms: bacillary, vibrio-like, spirillum-like, and also under the form of long filaments. These various forms can be seen in the same preparation made from the condensation water of glucose agar tubes.

Agglutination.—The organism was not agglutinated by the blood of the patient from whom it was isolated, nor from other cases of dysentery.

Animal Experiments.—Guinea-pigs were inoculated with an emulsion of the germ. The injection was not followed by any reaction.

Pathogenicity.—The germ is apparently only found in cases of dysentery, especially bacterial-dysentery, but does not seem to take any part in the etiology of the condition. It may perhaps play a symbiotic rôle.

Conclusion.

From a case of dysentery a pleomorphic germ was isolated which microscopically showed the morphological characters of a vibrio, a bacillus, and a spirillum. From the results of the microscopic and cultural investigation, I have come to the conclusion that the organism I have isolated is *Vibriothrix zeylanica* Castellani. This organism, as already noted by Castellani, Taylor, Anigstein, &c., is not pathogenic, but has a certain practical importance for the clinical bacteriologist, as on superficial examination it might be mistaken for a germ of the true dysentery group as its colonies on coloured special media, such as MacConkey, Drigalski-Conradi, Endo, &c., are extremely similar to those of the dysentery bacilli, and it does not produce gas in any sugar media.

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Tuberculous Pyopneumothorax treated with Methylene Blue (J. Rosenblatt and B. P. Stivelman, *American Review of Tuberculosis*, Baltimore, December, 1921).—The authors report two cases of tuberculous pyopneumothorax treated by injections of a saturated alcoholic solution of methylene blue. Three c.c. of the solution was injected at a time until sterilization was accomplished. The results were successful in all cases.

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THE JOURNAL OF

Tropical Medicine and Hygiene

April 15, 1922.

SIR PATRICK MANSON.

The public career of a great man found a fitting and suitable ending at St. Paul's Cathedral on Wednesday, April 12, 1922, at 12 noon, when a service in his honour was held in the presence of representatives of the scientific societies and the public authorities of Great Britain.

The story of Sir Patrick Manson's life's work has been told many times, and his great teaching and discoveries are a prominent part of the history of the realm. The writer was more closely in association with him, and for a longer period of time, than any other professional man alive. Whilst the writer was a student of arts and medicine in Aberdeen he lived within a few doors of his father's house in King Street, Aberdeen, where his father was manager of the Aberdeen Branch of a well-known Scottish bank.

The family residence and property was at Fingask, a short distance from Aberdeen, whither the family sojourned for what we now call "week-ends and later for good. Sir Patrick's brother, David Manson, graduated in medicine in the early 'seventies, and went to join his brother in Amoy in China after some six months as resident medical officer at the Middlesex Hospital, London. A short career in China terminated as the result of sunstroke, when, much against his better judgment, he took part at a cricket match in the height of the hot weather. By David Manson's death the profession lost one of its most prominent young men; a first-class athlete, the most popular student of his time at Marischal College in Aberdeen, and one of the most handsome men in the county, the death of his brother was one of the black days in Sir Patrick's lifetime, for it was owing to his advice and invitation that his brother went to China.

In his early "teens" Sir Patrick's bent was towards engineering, and it was at a firm of engineers at Ferry Hill, Aberdeen, where he injured his dorsal spine through over-strenuous exertions in the works. This not only laid him up for many months, but necessitated, much to his regret, abandoning his profession as an engineer altogether. After some hesitation as to the choice of another channel for his life's work, luckily for science and the welfare of mankind, he chose medicine.

Almost immediately after graduating in Aberdeen, Sir Patrick accepted a post as medical officer under the Chinese Imperial Maritime Customs Service in the then little known island of Formosa in the China Sea, then under the jurisdiction of China and now part of the Empire of Japan.

There in the north of Formosa, among quagmires of burning sulphur springs, with a population of independent savages head-hunting being their life's work, and raids on the Chinese and the few Europeans that were engaged in commerce at isolated spots Manson took up his abode. No one had ever penetrated into the interior, where the "Savagee King" held sway. No railways, no roads, and the only means of conveyance being by chairs carried by Chinese bearers, who picked their way between burning sulphur pools and bogs, and the only relief to the monotony of the day's work was when one or more of the bearers stumbled into the burning quagmires, where saving life was well-nigh impossible. Chinese food was the staple article of diet, and that of a very inferior quality,

while the water was from wells which served first as sewage tanks and then as drinking water. Malaria, filaria, dysentery, &c., held supreme sway, small-pox was unchecked, and the whole surroundings surely one of the most "deadly climates" ever known to man. Here in the uttermost parts of the earth the saviour of the tropics appeared amongst us, his food less savoury than locusts and wild honey, and his fellow-beings head-hunting savages.

Medicine in the 'sixties was primitive, pathology was practically unborn, the use of the microscope, the very instrument itself, existed in few of our medical schools. In 1871, when I came to Charing Cross Medical School in London, there was no microscope, and for more than two years there was but one microscope available to teach the students in physiology, pathology, &c. It may be affirmed with every regard for truth that Manson had never looked down a microscope in his life before he went to Formosa. Yet we have in the Maritime Customs report in the "seventies," just after the writer came to London, and found no (or but one) microscope in the schools, Manson published papers, "Metamorphosis of Filaria Sanguinis Hominis in the Mosquito." The keynote of modern medicine was already struck in these unprepossessing conditions and with appliances that were as yet but in swaddling clothes. Manson as soon as possible made his way home to meet but an ungracious welcome. His theories were listened to at the medical societies with derision, and he and his scatter-brain notions were openly laughed at and reviled. In some newspaper reports which have appeared lately, Manson has been represented as walking in London about this time in shabby clothes due to having reduced himself to a state of poverty owing to having spent his utternost farthing upon his investigations. This is but "a bit of penny-a-lining" whilst wishing to hold up a hero to sympathy, &c. The statement is not true. Manson's family were never anything but well-to-do. Many fellows of the Royal Society of these early days spread the report that Manson was suffering from delusions, and that his statements were due to a mentality of doubtful stability due to climate.

On his removal to Amoy, Sir Patrick found himself more *in* the world of commerce and public affairs. He was brought more into the public ken and his characteristics and mental powers and ability appreciated, and his reputation extended over the coast and treaty ports of China and amongst the high authorities in Chinese Government and social circles. As a doctor he came to be recognized as a foremost figure amongst notable foreign doctors. So widespread had his reputation become that he amassed a fortune of considerable dimensions, and he left China to seek a place in Britain. Owing to a good-hearted action towards a friend in his monetary difficulties he resolved to return to the East, and this time he settled in Hong-Kong. His name was already well known in that colony, and on his settlement there his practice rapidly assumed very large dimensions, and in the course of a few years he was once more in a position to think of again retiring. In 1889 he left Hong-Kong, having entered into partnership with Dr. William Hartigan, a practitioner of high repute in Hong-Kong before Manson went there, and one whom he regarded with so great respect that he disposed of his practice to him. A further member of the firm was sought for, and to the writer a share in the firm was offered and accepted in 1887. The writer was then Demonstrator of Anatomy at Charing Cross Hospital Medical School in London, and had held that post for sixteen years, and had been assistant-surgeon and surgeon to the Hospital for ten years. The writer had the good fortune to be intimately associated with Sir Patrick for two years before he left the colony for London in 1889. The advantage to the writer of that great opportunity was fully appreciated, and he blesses these two years' close association with the master-mind of so high an exponent as the period of his scientific enunciation and training. He learnt the meaning of applied science in the practice of medicine, and he soon came to reverence and respect the quality of the mentality of the great man with whom he was in daily and intimate contact. It is difficult for the writer to bring home to others what that meant; it was before Manson's reputation attained that public fervour which became attached to his name after the application of the immortal discoveries he had made in Formosa and Amoy over the part the mosquito played in the conveyance of the *Filaria sanguinis hominis* from man to man and all that that meant, and its application to the spread of malaria by the formulation and establishment of the mosquito-malaria theory. Manson's future discoveries and his rise in fame were no surprise to the writer, for he knew the superlative qualities of Manson's mind, and that there was nothing in the department of science to which he had devoted himself that was not within the reach of his attainment.

JAMES CANTLIE.

(*To be continued in the next copy of the Journal.*)

MEMORIAL SERVICE AT ST. PAUL'S.

Lord Wodehouse represented Mr. Churchill at a memorial service for Sir Patrick Manson, which was held yesterday in St. Paul's Cathedral. Bishop Montgomery, the Archdeacon of London (the Ven. E. E. Holmes), Canon Alexander, and the Rev. E. T. R. Johnston were the officiating clergy. The service was choral, and included the psalm "The Lord is my Shepherd," the hymns "Abide with me" and "Now the labourer's task is o'er," and the anthem "Thou wilt keep him in perfect peace," and at the conclusion of the service Chopin's Funeral March was played. The chief mourners were Lady Manson, Dr. and Mrs. Philip Manson Barr and their children, Mrs. Richardson, Miss

Richardson, Mr. Forbes Manson, Mr. and Mrs. Allen McLean, Mrs. Hossack, and Mrs. E. L. McLean. The large attendance included, among many others:—

Sir Reginald Antrobus, Sir Ronald Ross, representing the Royal Society; Sir James Cantlie, representing the Royal Society of Tropical Medicine and Hygiene; Sir Charles Lucas, Major-General Sir William B. Leishman, Admiral of the Fleet Sir Henry Jackson, Captain George Hodgkinson, R.N., Sir James Mitchell, and Mr. R. E. V. Bax, representing the Seamen's Hospital Society; Professor Sir Frederick Andrewes, representing the Lister Institute; Sir Humphry Rolleston, Sir John Bland-Sutton, Colonel Sir William Smith, Colonel Sir Lisle Webb, Mr. James Berry, Professor George H. Falkiner-Nuttall, representing Cambridge University; Mr. Grant Ramsay, Mr. William Turner, Dr. May Thorne, representing the London (Royal Free Hospital) School of Medicine for Women; Dr. J. Mitchell Bruce, Miss Aldrich Blake, Mr. R. P. Thurburn, Dr. Harold Spitta, representing St. George's Hospital Medical School; Lieutenant-Colonel H. M. Perry, Colonel Kennedy, Mrs. Punnett, Dr. Andrew Bullford, Dr. Stevenson, representing the Wellcome Bureau of Scientific Research; Dr. and Mrs. Low, Miss Knight, Dr. Newham, Miss Judson, Dr. A. L. Gregg, Mr. R. Grant, Mr. J. L. Noble, Mr. and Mrs. Scott Henderson, Mrs. Logan, Mrs. Pickering, Mrs. J. M. H. Macleod, Dr. Marshall, Mrs. R. Peache, Mr. J. Hare, Mr. and Mrs. Maurice FitzGerald, Dr. Mason, Colonel J. J. and Mrs. Pratt, Dr. Hanshell, Mr. Eric Hervey, Colonel S. P. and Mrs. James, Mrs. Gordon Patterson, Dr. Quirk, Dr. Esdaile, Mr. Walter Judd, Mr. A. Mackenzie, Mr. R. T. Leiper, Dr. Anderson, Dr. Scott-Stevenson and Dr. N. G. Horner, representing the British Medical Association; Dr. A. O. P. Reynolds, Colonel Evan Gibb, Dr. Andrew Foy, Dr. G. Basil Price, Dr. F. G. Spear, and Mr. J. C. Gilbert. The Tropical Diseases Bureau was represented by Dr. A. G. Bagshawe, Director.—From the *Times*, April 11, 1922.

Annotations.

A Rare Form of Suppurating and Cicatrizing Disease of the Scalp (F. Wise, M.D., and H. J. Parkhurst, M.D., *Archives of Dermatology and Syphilology*, vol. iv, No. 6. December, 1921).—This disease is a rare one, only three cases being reported in literature. The clinical appearances in these three cases are almost exactly alike. In its active stages, before atrophy and scarring have taken place, the disease picture differs markedly from that of any other atrophying and destructive disease of the scalp. In its end stages, after complete involution has occurred, the affected areas resemble those seen in folliculitis decalvans, pseudopelade and other similar conditions.

Assuming that the purulent element in this malady is due to secondary invasion of pus organisms, the causative factors are as obscure as in the destructive affections of the scalp mentioned before. This is of especial interest in view of the histopathologic structure of an active nodule, revealing, as it does, a granuloma, with features resembling a tuberculous process. An almost identical microscopic picture was seen in a case described by Reute.

Experimental Inquiry into the Cerebral and Neuromuscular Manifestations of Digitalis (D. I. Macht, M.D., and Wm. Bloom, *Archives of Internal Medicine*, vol. xxviii, No. 5, November, 1921).—The effects of various digitalis bodies were studied on the behaviour of rats in the circular maze. It was found that the various digitaloids, even when given in comparatively small doses, produced a depression in the behaviour of animals. These experimental observations agree with the clinical experience of Duroziez and other clinicians.

Bacteriology and Treatment of Typhus (Perez Canto, *Revista del Instituto Bacteriologico*, Buenos Aires, March, 1921).—The author reports that in the two years ending September, 1920, 8,400 people died from typhus in Santiago de Chile. A diplococcus was cultivated from some of the cases which appeared to be the causal agent; and a vaccine made from this diplococcus appeared to shorten the course of the disease, and also reduced the mortality to one-third in the hospital in which it was used in comparison to other hospitals.

Trench Fever. Final Report of the War Office Trench Fever Investigation Committee (Major-General Sir David Bruce, A.M.S., *Journal of Hygiene*, vol. 20, No. 3, November, 1921).—The author is of the opinion that in all probability one attack of trench fever does not confer immunity as it does in measles, scarlet fever, or small-pox, but it gives a partial immunity as in influenza or pneumonia.

The virus of trench fever cannot be said to be ultra-microscopical and a filter-passer in the same sense as these terms are used at the present day. It may rather be concluded that the organism is small, since it succeeds in passing through a Berkefeld filter on two occasions. Such a body about the size of the so-called *Rickettsia* would seem to fulfil the conditions, and the result of the filtration experiments would appear to be rather more in favour of the hypothesis that *Rickettsia* are the cause of the disease than against it.

Growth of Fibroblasts and Hydrogen Ion Concentration of the Medium (Albert Fischer, M.D.,

Journal of Experimental Medicine, vol xxxiv, No. 5, November, 1921):—The rate of growth of fibroblasts is markedly modified by slight changes in the hydrogen ion concentration of the medium. The curves expressing the rate of growth in function of the hydrogen ion concentration of the medium are nearly symmetrical on both sides of the maxima. The optimum growth of fibroblasts occurs at pH 7·4 to 7·8. A slight change from this reaction has a remarkable action on the rate of growth. Fibroblasts show more resistance to higher alkalinity than to higher acidity. They grew for only four to six generations in a medium having a pH of 5·5, and for more than ten generations in one of 8·5. The influence of different hydrogen ion concentrations on fibroblasts was only of a quantitative nature.

Transmissibility of Leprosy (Belmiro Valverde, *Brazil-Medico*, October, 1921).—The author is of the opinion that the assumption that leprosy can be transmitted by mosquitoes is not correct. He states in support of his opinion that Bahia used to be one of the largest leprosy foci in Brazil. In 1763 the Governor reported the presence of 4,000 lepers in his district, but no measures were taken to stamp out the disease; at the present time the disease is extremely rare, but mosquitoes abound in large numbers.

Duration of Diabetes (K. A. Heiberg, *Zeitschrift für klinische Medizin*, Berlin, November, 1921).—The author reports on the deaths in Denmark due to diabetes during the last ten years. There were in all 683 women and 820 men. Under the age of 30 the course was less than nine months in 25 per cent.; less than fifteen months in 50 per cent.; and less than two and a half years in 75 per cent. After 50 years the course averaged seven years and three months in women and nine years in men.

Bacillus aerogenes capsulatus Infection complicating Typhoid Fever (Henry R. Muller, M.D., and J. S. Lincoln, M.D., *The Medical Record*, vol. ci, No. 5, February 1922).—In view of the fact that the *Bacillus aerogenes capsulatus* is found in the gastro-intestinal tract of the majority of individuals, it is rather surprising that the occurrence of secondary infection with this organism in typhoid fever is not more frequent than is reflected in the literature. The necrotic material in the ulcers, one would suppose, would furnish a suitable medium for the development of the organism, but, undoubtedly, other conditions must be fulfilled before it can invade the blood or lymph stream. Just what these factors are is not entirely known, though it appears that in certain instances other organisms prepare the way for its invasion into the body.

On the other hand, the invasion of the gas bacillus may actually be as infrequent as the observations seem to indicate, i.e., the physical conditions in the typhoid ulcers, the resistance of the patient, or the virulence of the organism are such that invasion rarely occurs; or, the portal of entry is not opened to the gas bacillus by other organisms.

Notes on the Incidence of Filarial Infection in the Neighbourhood of Lamu, British East Africa (G. Dunderdale, M.D., M.R.C.S., *Transactions of the Royal Society of Tropical Medicine and Hygiene*, vol. xv, Nos. 5 and 6, November and December, 1921).—Elephantiasis and filariasis appear to exist all along the coast of British East Africa, with the exception of the most northerly portion.

From the Tana River (40 miles south of Lamu) up to Kiunga (about 50 miles north of Lamu) these conditions are to be found, but the localities where they are most common are undoubtedly the islands of Lamu and Patta, and certain areas on the Tana River. On the mainland, except for the Tana River area, the diseases under consideration are far less common, and occur in the majority of cases among island natives who have settled on the mainland.

The common obvious form of the disease elephantiasis is that affecting the legs, known locally as "madende"; scrotal elephantiasis also occurs commonly. No other forms of this disease were seen, although some cases of lymphangitis occurred which closely resembled it, and affected the arms. These, however, are not classed as elephantoid lesions proper, but as filarial. Of the latter many are to be seen. Filarial fever is frequent, and lymphangitis and hydrocele common.

A Case of Bilharziasis cured by Tartar Emetic administered Intravenously (L. C. D. Hermitte, M.B., Ch.B.Edin., *Transactions of the Royal Society of Tropical Medicine and Hygiene*, vol. xv, Nos. 5 and 6, November and December, 1921).—The author describes a case of endemic hæmaturia cured by the intravenous injection of tartar emetic, 13½ gr. of which were necessary before fresh eggs ceased to appear in the urine. The course was as follows:—

Half grain	every	second	day	for	3 doses.
One grain	,,	,,	,,	4	,,
Two grains	,,	,,	,,	4	,,

The urine was centrifugalized and examined daily, so that the progress of treatment was closely and carefully watched. As the treatment progressed the ova gradually became shrunken, shrivelled, blackish in colour with their contents granular, and could not be made to hatch, however long they were left in the water. The injections were stopped immediately fresh eggs ceased to appear in the urine. Blackened ova kept appearing after the

cessation of the injections, at first fairly numerous, but gradually becoming fewer, until on the eighteenth day after the last injection no ova appeared in the urine.

Along with the bilharzial infection the patient had a severe complicating cystitis with much pus and *Bacillus coli* in the urine. On the recommendation of Colonel Marshall, washing out of the bladder was avoided. It was treated by hexamine both during the tartar emetic treatment and after. The cystitis cleared up after two months' internal administration of hexamine. The urine is now clear and normal, and all the other symptoms have disappeared.

Experimental Studies on the Etiology of Typhus Fever. Filtration Experiments (Peter K. Olitsky, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 2, February, 1922).—Experiments tend to show that the typhus virus in the tissues of the guinea-pig during the height of reaction to the experimental disease does not lose its infecting power when the cells of the brain or of the spleen are disintegrated by repeated freezing and thawing, or by freezing and desiccating, or by crushing by mechanical means, or by grinding into a homogeneous pulp with sand. The virus after such treatment is as actively infective as in the same tissue not subjected to the disintegrating influences. The possibility exists, therefore, of an intracellular condition of the typhus virus.

Fourteen attempts to filter through Berkefeld V and N candles the virus contained in the disintegrated tissue all resulted in failure.

Experimental Studies on the Etiology of Typhus Fever. Survival of the Virus in Aerobic and Anaerobic Culture Media (Peter K. Olitsky, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 2, February, 1922).—In a variety of media kept at 37° C., and from which oxygen is excluded by a petrolatum seal, the typhus virus tends to die rapidly. In the corresponding media under aerobic conditions, the life of the virus is appreciably longer.

The Use of Phenol Red and Brom-cresol Purple as Indicators in the Bacteriological Examination of Stools (Alan M. Chesney, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 2, February, 1922). —Either phenol red or brom-cresol purple may be used as indicators in the preparation of lactose-agar plates for the isolation of members of the typhoid-dysentery group of bacteria from stools. Of the two, brom-cresol purple gives sharper differentiation and is to be preferred.

These indicators exercise no restraining influence upon the growth of cultures of the typhoid bacillus or paratyphoid bacillus freshly isolated from the human body, or of laboratory cultures of *Bacillus dysenteriæ*.

Both indicators may be successfully employed with brilliant green in the isolation of the typhoid-paratyphoid group from stools without sacrificing the restraining activity of the brilliant green upon other bacteria.

Heterogenic Serum, Age, and Multiplication of Fibroblasts (Alexis Carrel, M.D., and Albert H. Ebeling, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 1, January, 1922).—Heterogenic sera inhibit and prevent the growth of chicken fibroblasts when their concentration is made to vary within certain limits.

A relation exists between the rate of growth of chicken fibroblasts, the concentration of the heterogenic serum, and the age of the animal from whom the serum is taken. Thus, the rate of proliferation of chicken fibroblasts expressed by the growth index of the serum can be used as a means for detecting certain changes brought about by the age in a heterogenic serum.

The Permanence of the Serological Paratyphoid B. Types, with Observations on the Non-specificity of Agglutination with "Rough" Variants (H. Schutze, M.D., *Journal of Hygiene*, vol. xx, No. 4).—Among a large number of strains belonging to the various absorption types of the paratyphoid B. group and kept under observation in laboratory culture over a number of years, constancy of type has been demonstrated. Only two alterations in the serological nature of certain cultures have been noted; they were due (*a*) to the development of so-called "rough" variants, (*b*) to the degeneration of strains into antigenically less effective "substrains."

Though both are variations within the limits of the absorption type, the serological character of the affected strains may be so obscured that a greater variation than has actually taken place may be ascribed to them, unless the precautions indicated are observed.

When "rough" strains are in question, agglutination results are to be mistrusted, for a marked cosmopolitanism in respect of this test has been seen to exist among such alien species as *Bacillus enteritidis* Gärtner, *B. paratyphosus* A. and *B. paratyphosus* B.

A Comparative Study of Bovine Abortion and Undulant Fever from the Bacteriological Point of View (Z. Khaled, *Journal of Hygiene*, vol. xx, No. 4, December, 1921).—Morphologically, *Bacillus abortus* and *B. melitensis* are identical. The "coccoid" form is not a constant feature.

The organisms cannot be differentiated by cultural, biochemical, or staining methods, or by the agglutination reaction. From absorption experi-

ments, it would appear that *B. melitensis* is a substrain of *B. abortus*. Dose for dose, *B. abortus* is much less virulent for the guinea-pig than *B. melitensis*, approximately about 1:6.

Immunization of monkeys with killed suspensions of *B. abortus* protected against subsequent infection with *B. melitensis*.

The Therapeutic Index of Silver Arsphenamin (A. Strauss, M.D., D. M. Sidlick, M.D., M. L. Mallas, M.D., and B. L. Crawford, M.D., *Journal of the American Medical Association*, vol. lxxviii, No. 9, March, 1922).—The authors came to the conclusion that the spirochætal activity of silver arsphenamin was far inferior to arsphenamin and neo-arsphenamin in the treatment of syphilis. This conclusion was drawn from the serological comparisons. Three different groups of patients were treated with silver arsphenamin, arsphenamin and neo-arsphenamin respectively. The dosage employed throughout the treatment was silver arsphenamin, 0·2 grm.; arsphenamin, 0·4 grm.; and neo-arsphenamin, 0·6 grm. The determination of the comparative values of the three drugs was based on the Wassermann reaction.

The seropositive findings in Group 1 were changed to negative in only one instance. In Group 2 the positive Wassermann reaction became negative in thirteen cases. In Group 3 the Wassermann reaction was changed from positive to negative in nine cases.

Abstracts and Reprints.

ANTIMONY IN LEPROSY.[1]

By G. H. Wildish, M.B.

In view of the reported benefit derived from the antimony treatment of some Indian lepers at Durban in 1920, Dr. F. G. Cawston asked me to give antimony a trial on a more extensive scale amongst natives at the Amatikulu Leper Institution in Zululand. No special treatment for the disease had been used there, reliance being placed on fresh air, good food, careful dressing of ulcers, cod-liver oil, and to a lesser extent chaulmoogra oil by the mouth.

I decided to test oscol stibium in the treatment of twenty of the worst cases, mostly cripples who were being housed in the central hospital while awaiting death. The majority of these cases received doses of the drug intramuscularly, 2·5 c.c., 3 c.c., and 6 c.c. on consecutive days. Three weeks later 4·5 c.c. and 6 c.c. were given on consecutive days. This series of two doses was repeated during the next two months, making a total of about 40 c.c. injected.

Beneficial effects were seen in the relief of paralysis, drying of the ulcers, and in the general condition of all the patients treated except one, who has shown no change at all so far. Similar successful results were obtained from the use of Crookes's colloidal antimony, which proved more toxic and more effective; equally good results were obtained in a few cases treated with tartar emetic intravenously.

Over 1,000 injections have been given at the Amatikulu Institution during the last six months; there has been serious local inflammation or abscess. In each case the needles and syringes were sterilized before use by means of mercury biniodide in methylated spirit followed by pure methylated spirit, and the site of the injection was sterilized by mercury biniodide solution.

Though antagonistic to the treatment when first adopted, these leper patients have developed a great belief in its efficacy, and in most instances have themselves requested that it should be continued. In the case of the Zulus this request is very significant—they do not like medicine injected.

At the present time (July) ninety-eight female natives and 131 males are being treated with various preparations of antimony; four of these have recently been treated with ethyl esters after two series of injections with antimony, and their progress points to the efficiency of the combination.

Although still in its early stages, the results at the end of six months have been very encouraging, and suggest antimony treatment in considerable doses for short periods, with intervals of three weeks between each series, as a great help in treating leprosy and possibly as a cure in some cases. It is also useful in combination with ethyl esters and sodium hydnocarpate.

At a later date it is hoped to give a more extensive report of the effect of antimony on a large series of cases, but at the end of six months' treatment one can say without fear of contradiction that antimony has a very decided value in the treatment of leper patients, more particularly those who are exhibiting severe manifestations of the disease. Dr. Andrew Balfour of the Wellcome Bureau saw these cases when visiting Natal, and they have been inspected by a considerable number of medical men from various parts of South Africa who are interested in the progress of the treatment.

[1] Abstracted from the *British Medical Journal*, No. 3185, January, 1922.

A MISUSE OF AUTOGENOUS VACCINES.[1]

By C. E. Jenkins, M.R.C.S., L.R.C.P.

A new method of treatment passes through four well-defined stages. It is first ignored, then cautiously examined, and, if results seem promising, it is taken up with a reckless enthusiasm

[1] Abstracted from the *Practitioner*, vol. cvii, No. 2, August, 1921.

and tried upon every sort of malady. Soon it becomes painfully clear that the new remedy is not a universal cure, and there arises a new school of opinion, the members of which are united by the common bond of blind denial of every statement connected with the remedy. The follies of the enthusiasts have usually supplied their opponents with an abundance of ammunition. It is at this stage that the possibilities of the treatment first receive an impartial examination, undertaken to ascertain its uses and limitations.

Vaccine therapy has already passed this last stage, and its utility cannot be disputed. The broad principles that govern the use of vaccines are now well understood, but there is still ample room for investigation into the details of the selection of the type most suitable for different conditions.

That an autogenous vaccine is superior to a stock vaccine as a curative agent is well known. The latter is recognized as the proper type to use for prophylaxis, because one seeks to produce immunity against a disease which might be contracted at some future date. No exception can be taken to these truths in themselves, and, if the appropriate type was used in every case, the question with which this note deals would not arise.

It might be supposed that no very profound thought is needed to perceive whether the aim of administration is curative or prophylactic, yet it can be shown that there is at least one common malady that is frequently placed in the wrong category. Recurrent acute catarrh of the upper respiratory passages is much the commonest minor malady which is treated by vaccines. The sufferers from this complaint can be divided into two main groups. The first group is probably the smaller. In this the patients have a permanent chronic catarrh of varying intensity, and are subject to periodical acute exacerbations, usually brought on by climatic changes or exposure. An autogenous vaccine is the correct type to use for these cases, because the condition is always present and the vaccine is required for curative purposes. The second and larger group comprises those persons who are usually free from any sign of catarrh, but who invariably "catch cold" if brought into contact with anyone suffering from an acute catarrh.

An autogenous vaccine is frequently prepared for these cases. The time chosen at which to obtain the specimen for culture is during the height of an attack, or, at any rate, as soon after the acute stage as possible. In these circumstances the causal organism can usually be isolated, but it is important to keep in view two facts. The first is that the organism is the causal one of that particular attack. It affords no proof that future attacks will be caused by the same organism. The second point to be borne in mind is that the vaccine will be used for prophylaxis; that is to say, to prevent the patient contracting another attack in the future.

It may be conceded that if the patient should again be brought into contact with a case of catarrh due to the same organism, his resistance would be greater after a course of vaccine treatment. But if the vaccine is expected to confer an immunity against acute nasal catarrh in general, and wherever he may be exposed to infection, there follows of necessity the assumption that acute catarrh of the upper respiratory passages is always due to the same organism. Such an hypothesis is manifestly absurd, for it is an established fact that the identity of the predominant organism varies in different epidemics, and even in the same epidemic in different parts of the country.

The autogenous vaccine under consideration would have no power to protect against any of the other organisms. A mixed stock vaccine is free from this objection. It is designed to protect against all the common catarrhal organisms, and is based upon the reasonable assumption that the causal organism of the patient's next attack will fall within its area of protection.

It is no exaggeration to say that it is a gamble to use an autogenous vaccine for the type of cases described. It is also bad policy on general grounds, for, in addition to the defects already mentioned, it creates a false confidence which is usually followed by a corresponding degree of discouragement when its failure becomes manifest. The aspect of its failure is rendered the more prominent by reason of its special preparation, for the patient is likely to reason from the analogy of a suit of clothes—if the "made to measure" is a failure, what can one expect of the "ready made"? The virtues of the autogenous vaccine have been so firmly fixed in our minds that there is some danger of it becoming an obsession, leading to a failure to distinguish clearly the essential differences between curative and prophylactic vaccines. There are no more complex therapeutic agents than vaccines, and a closer study of them, from the standpoint of what they are required to do, will repay the prescriber.

THE COTTON-WOOL PLUG TEST FOR INDOLE. A NEW TECHNIQUE OF APPLYING EHRLICH'S REACTION FOR DETECTING INDOLE IN BACTERIAL CULTURES.[1]

By S. N. Gore, L.M. & S. (Bombay University).

Indole production has come to be recognized as an important distinguishing biochemical property of a bacillus, and many special methods have been devised for its observation.

Of the numerous colour reactions recommended for detecting indole in bacterial cultures the two that are in common use at the present day are:—

[1] Abstracted from the *Indian Journal of Medical Research*, vol viii, No. 3, January, 1921.

(1) The "nitroso-indole" (nitrous acid) reaction of Baeyer, and

(2) The "rosindole" (para-dimethyl-amido-benzaldehyde) reaction of Ehrlich.

All the principal methods of applying these two reactions for routine examinations have proved unsatisfactory for one or more reasons. Some are too crude to detect small amounts of indole; others are cumbersome and laborious, while all are lacking in being specific for indole.

A criticism of these methods is published in a separate paper [1].

In the light of this criticism, the only test that has been found to meet all the requirements (viz., specificity, delicacy and simplicity) of a reliable qualitative colour test is the cotton-wool plug test devised by the author and used by Captain R. H. Malone, I.M.S., when making observations on the productions of indole by Pfeiffer's bacillus [2].

In order that this valuable test may be more widely known, it is described here in detail.

The Cotton-wool Plug Test for Indole.

Stated briefly, this test consists in moistening the under-surface of the cotton-wool plug of the culture tube with a few drops of Bohme's solutions, and heating the tube for a few minutes. In the case of a positive result, a rose colour appears on the under-surface of the plug.

Materials required for the Test.

Bohme's Solution, No. 1.

Para-dimethyl-amido-benzaldehyde ...	1 grm.
Absolute alcohol	95 c.c.
Hydrochloric acid	20 c.c.

Bohme's Solution, No. 2.

Potassium persulphate	1 grm.
Distilled water	100 c.c.

Note.—These two solutions may be conveniently stocked in glass-stoppered bottles.

Some arrangement for keeping water gently boiling.

Details of the Test.

(1) Remove the plug of the culture tube and, if it does not already consist of white absorbent cotton-wool, cover its under-surface either with a thin layer of such cotton or with a piece of filter paper.

Note.—A white absorbent surface is essential, as Ehrlich's colour reaction is to be effected and observed thereon.

(2) Moisten evenly the under-surface of the plug first with a few (4—6) drops of the persulphate solution, and then with a few drops of the para-dimethyl-amido-benzaldehyde solution.

Note.—The persulphate is necessary, as it helps to oxidize the indole compound from a lavender to a rose colour; the latter colour is more intense than the former, and the persulphate thus adds to the delicacy of the reaction.

(3) Replace the treated plug, and push it down the tube until it is an inch or an inch-and-a-half above the surface of the broth culture.

Note.—This is essential, in order that when the broth is heated most of the indole-vapour from the broth may be absorbed by the under-surface of the plug, instead of condensing on the walls of the test-tube.

(4) Place the prepared culture tube upright in the gently boiling water-bath.

Note.—This precaution is necessary to prevent the broth from coming in contact with the plug and thus vitiating the specificity of the test.

(5) Allow the tube to be heated for about fifteen minutes.

Note.—During this period sufficient indole volatilizes to give a positive reaction even when the quantity of indole is as little as 0·0005 mg. per cubic centimetre of the broth culture.

(6) Now remove the test-tube from the water-bath, and examine the under-surface of the plug *in situ* in a good light.

Result.—If indole be present in the culture, the under-surface of the plug becomes rose-coloured owing to the volatilized indole reacting with the Bohme's solutions.

In the case of a negative result the cotton-wool plug remains unaffected.

N.B.—The test may be performed with agar as well as with broth cultures.

From the above description of the cotton-wool plug test for indole it will be seen:—

(i) That specificity is attained by subjecting only the volatile products to the colour reaction, indole being the only volatile chromogenic product in aerobic bacterial cultures.

(ii) That delicacy is attained first by using Ehrlich's aldehyde—the most sensitive reagent for indole, and, secondly, by performing and observing the colour reaction on a white absorbent surface.

(iii) That simplicity is attained by moistening the under-surface of the cotton-wool plug of the culture tube with a few drops of Bohme's solutions and heating the tube for a few minutes.

The presence of indole is denoted by a rose colour on the under-surface of the plug.

REFERENCES.

(1) Malone and Gore. *Indian Journal of Medical Research*, 1920, vol. vii, No. 3, 519.
(2) Malone. *Ibid.*, 1920, vol, vii, No. 3, 519.

INFANTILE DIARRHŒA.[1]

By Captain G. H. Wood, R.A.M.C.

The following case of severe infantile diarrhœa and the successful use of oral administration of cold tea infusion might be of interest to readers both at home and abroad:—

A healthy English boy, aged 7½ months, in a

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxviii, No. 3, March, 1922.

Plains Station in the Punjab at the beginning of the hot weather of 1921, was in the early stages of somewhat delayed dentition; his parents, thinking he was not thriving sufficiently on the rather poor Indian milk, added a couple of teaspoonfuls of unsterilized cream to his bottle on three or four occasions during a couple of days, after which time he developed an acute attack of green diarrhœa which persisted throughout the day, as a result of which albumen water was substituted for milk for twenty-four hours, and a dose of castor oil was given.

An attempt to resume milk feeding the next day was followed by vomiting and increased diarrhœa, and all milk was withheld for forty-eight hours, during which time albumen water and chicken broth were given and an emulsion of castor oil was proscribed, given in small doses frequently. At the end of this time the diarrhœa had abated, and the boy was given some very weak Glaxo with a view to milk-feeding being resumed. This was followed by vomiting, and diarrhœa set in again more violently than ever with marked tenesmus and frequent liquid green stools with mucus and occasional streaks of blood. Albumen water, rice water, sherry whey, and tartaric acid whey were then resorted to, accompanied by the usual antiseptic infantile powders, but the passage of frequent stools of the colour and consistency of chopped spinach continued, and was accompanied by vomiting at times. By this time the little patient was becoming very exhausted and emaciated, and high rectal irrigation with normal saline was carried out three or four times daily by means of a No. 25 French catheter; the saline was at first absorbed well and brought about a short refreshing sleep on occasions, and undoubtedly compensated for the loss of fluid from the tissues. Daily inunction of the body with olive oil and a little brandy in it was also practised and did much to maintain the body heat. All attempts to control the diarrhœa, however, failed, and the frequent passage of liquid green stools with occasional severe vomiting continued, pointing to a severe ileocolitis, on which the usual antiseptic and astringent drugs, such as bismuth and salol, had no effect. The occurrence of vomiting was a very alarming feature, and, though alleviated by sips of weak brandy and water, rendered it practically impossible for powders to be given with any benefit, though tried repeatedly. Finally, a slight modification of Roseberry's chlorine water mixture was given as under:—

Quin. sulph.	...	– gr.
Salol ...	...	4 gr.
Mucilage tragacanth	...	q.s.
Aq. chlori ...	...	ad 1 oz.

1 t.d.s.

This mixture, in spite of its unpleasant taste and smell, was well taken by the little patient, and some slight benefit was also obtained from rectal injection of a thin mucilage of starch containing a drop or two of tinc. opii.

At last, about the twelfth day, more in despair than with any real hope of success—the patient being now obviously *in extremis*—feeds of cold weak tea were commenced, given without milk or sugar, as recommended by Lowenberg. This is made in the ordinary way in a teapot, a teaspoonful of tea-leaves to half a pint of boiling water, and left to stand about a minute. It is then poured off through a fine strainer into a half-pint tumbler or a small jug and left to cool. This infusion was taken eagerly by the little patient in sips from a teaspoon, as he was too weak to pull it from a bottle, and in the first twenty-four hours the number of motions decreased from fourteen to six, the colour changing from green to brownish black, the so-called characteristic "tea" motion. About one and a half to two pints of this cold tea infusion were taken during this time, and its effect was most striking right from the commencement.

The patient seemed stronger and its sedative action was very marked, not only on the bowel, but also on the entire system, as he slept for the first time during the illness, and there was complete cessation from the twitchings of the eyes and movements of the hands bordering on subsultus tendinum, which signs of severe constitutional disturbance had been such a disquieting feature of the few previous days. It was considered advisable to continue the tea infusion for another twenty-four hours, during which time the number of stools decreased to four of the same characteristic dark colour; this time, as the little patient seemed not to be taking the feeds so well, a very small quantity of sugar was added, no saccharine being available.

A cautious start was made next day with feeds of albumin water and whey, followed in a couple of days by very weak Benger's Food, which had previously stood half an hour before boiling in order to allow digestion. No relapse occurred, and from that day the little patient never looked back. The Benger's feeds were gradually increased in strength with less and less use of the digestive enzyme, until finally equal parts of milk and water were given with no ill-effects. The great heat of the Indian summer coming on was a matter of great anxiety during the convalescent period, but finally the boy was embarked for England on May 21 on whole milk feeds with no further recurrence of diarrhœa. He suffered terribly from insomnia during the first period of convalescence, but this gradually passed off as he regained his natural body-weight.

Bottles of sterilized cows' milk were obtained from the dairy at Aligarh for him for the homeward voyage, and when he landed in England in June he was little the worse for his severe illness which had nearly prevented him ever seeing his native land, and in the recovery from which, in my opinion, the use of cold, weak tea infusion as described played an absolutely decisive part.

I am indebted to Major W. M. Chesney, M.C., R.A.M.C. (retired), for permission to publish this case.

The tea treatment, though widely practised in America, and, I believe, in Germany, does not appear to have been much used in this country, although our infant mortality from so-called summer diarrhœa is undoubtedly high. The mode of action is peculiarly interesting, and I am of opinion that the small quantity of caffeine tannate in solution acts first of all as a stimulant by virtue of its caffeine and, in addition, as a definite intestinal antiseptic and astringent by virtue of its tannin element.

Major Chesney thought that the chief factor was the starvation diet it entails, but my own belief is that it has a definite action as noted above, and that as such it has a very distinct advantage over other forms of starvation diet, i.e., albumen water, whey &c. The fact that infantile diarrhœa has never been brought home to any particular bacterium does not rule out of court its undoubted infectivo origin, which is, of course, aggravated and flared up by errors and indiscretions in feeding, and the fact that milk products in any shape or form constitute a favourable pabulum for the growth and development of the infecting organisms, as evidenced by frequent relapses caused by too early a resumption of milk feeding, contribute to the belief that the tea treatment, bringing into the infected area as it does an absolutely foreign substance, is definitely hostile to the infecting organisms and rapidly causes their destruction; as such it is likely to become a valuable factor in the treatment of severe infantile diarrhœa.

Medical News.

UNIVERSITY OF LIVERPOOL.

AWARD OF THE DIPLOMA IN TROPICAL MEDICINE, MARCH, 1922.

THE Senate has awarded the Diploma in Tropical Medicine as under:—

J. R. Bhatia, M.B., Ch.B.; E. R. W. Gilmore, M.B., Ch.B.; A. R. Jennings, M.B., B.Ch.; S. H. Paul, M.R.C.S., L.R.C.P.; J. Pinder, M.R.C.S., L.R.C.P.; Gladys Rutherford, M.B., Ch.B.; Q. Stewart, F.R.C.S.E.

Recommended for the Alan H. Milne Medal: Dr. Q. Stewart.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT. 68TH SESSION. JANUARY-MARCH, 1922.

With Distinction: Cilento, R. W., M.B., B.S. (Adelaide), Winner of "Duncan" Medal; Andre, J H.; Dunham, G. C. (Major U.S. Army), M.D., D.P.H.(U.S.America); Mills, E. A., M.B., Ch.B. (Edin.); Giglioli, G., M.D.(Pisa); Wynne, T. G., M.B., B.S.(Melbourne); Kirk, J. B., M.B., Ch.B. (Edin.), D.P.H.(Oxford); Moore, D. G. F. (W. African Med. Ser.), M.R.C.P., L.R.C.P.

Hingston, H. (Capt. I.M.S.), M.B., B.S.(Lond.); Peacock, W. H. (West African Med. Ser.), M.B., B.S.(Durham), M.R.C.S., L.R.C.P., D.P.H. (Camb.); Gale, B. (Major I.M.S.), M.B., Ch.B. (Glas.); Joshi, B. L., M.B., B.S.(Punjab); Mack, E. S. E. (West African Med. Ser.), M.B., B.Ch., B.A.O.; Carr, R. T., M.B., Ch.B.(Edin.); Mody, M. S. H., M.B., B.S.(Bombay); Hennessy, J. M. R. (Capt. I.M.S.), L.R.C.P. & S.; Joy, H. C. V., M.B., B.S.(Lond.), M.R.C.S., L.R.C P.; Walker, G. B., M.B., Ch.B.(Edin.) (West African Med. Ser.); Fisher, V. M., M.B., Ch.B., B.A.O. (Dub.) (Kenya Med. Ser.); Grace, W. H., M.B. (Lond.), M.R.C.P., D.P.H.; Nacleker, G. G., M.B., B.S.(Allahabad); El Kattan; M. A. (Egyptian Med. Ser.), D.M.S.(Cairo); Mehta, D. R., M.B., B.S.(Lahore); Baillie, Miss E. G., M.B., B.Ch.T.C.(Dub.); Edmond, J. J. B., M.B., Ch.B(Edin.); Griffiths, Miss M. L., M.B., B.S. (Durham); Noble, A., M.B., Ch.B.(Aber.), D.P.H. (Aber.); Wood, C. A. (Capt. I.M.S.), M.B., B.S. (Lond.), L.R.C.P., M.R.C.S.; Clyne, C. M. G., M.B., Ch.B.(Aber.); Brown, Miss H. M., M.B., Ch.B.(Bristol); El Ramli, A. H., M.R.C.S., L.R.C.P.; Pigeon, Miss L. E., M.B., Ch.B.(Glas.); Razik, A., D.M.S.(Cairo), M.R.C.S., L.R.C.P.; Brass, J. G. B., B.S., M.D.(S. Louis), M.R.C.S., L.R.C.P.; Griffiths, J. A. (Nyassaland Vet. Ser.), M.R.C.V.S.; Kerr, J. G., M.B., B.Ch.(Belfast); Peck, E. F., M.R.C.S., L.R.C.P.

Correspondence.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—In the paper "Antimony in the Treatment of Lepers, &c.," which appeared in the journal for February 1, 1922, I see that I inadvertently recommended tartar emetic (potassium) intramuscularly. This would involve the use of a carbolic acid solution, and is not to be compared in efficiency with the freshly dissolved powder in saline given into the vein.

Mr. H. H. Curson, who undertook some experiments for me on fluke-infested sheep treated with tartar emetic in absolutely fresh solution at Grahamstown in 1920, has adopted the same procedure in cases of Nagana, *Trypanosoma congolense*, at Ntabanana, in Zululand, and writes: "As far as Nagana, *T. congolense*, is concerned, there is nothing to touch tartar emetic. I have only lost one beast here from Nagana."

Yours, &c.,

F. G. CAWSTON, M.B.Cantab.

16, *Britannia Buildings,*
Durban.
March 13, 1922.

Original Communications.

DENGUE *v.* MALARIA.

By R. E. Ingram Johnson, L.R.C.P., &c.
Colombo, Ceylon.

Since coming to Colombo to practice, rather more than two years ago, the importance and necessity for finding some true prophylactic and remedial agent against that fearfully prevalent disease malaria has been borne in upon me. Quinine, in its various forms, is the most reliable remedy known at present, but the question arises: is it really a permanent cure and a true prophylactic? Stitt, in his book "Tropical Diseases," quotes the case of a regiment of marines of the U.S. Army, who were sent to Panama. Whilst they were there, a period of one month, they were given 9 gr. of quinine a day as a prophylactic, and there was only an occasional case of malaria. 298 were then sent northwards by boat, and quinine administration was stopped. Two days later twenty cases of malaria were reported, next day fifty-three, and the next forty-five. The medical officer then resumed prophylactic doses of 10 gr. of quinine for those not ill, but in spite of that 215 cases of acute malarial paroxysms occurred out of the 298 men.

Although quinine will cure an actual attack of malaria, it is extremely doubtful how long the patient remains cured, as without any possibility of reinfection other attacks may come on.

During the course of last year (1921) two patients of mine, both of whom had lived in the East some years, and had had frequent malarial attacks, suffered from dengue while staying at the same hotel. Since that time, one six months, and the other four months, neither of them has had a malarial attack.

This, call it coincidence, set me wondering, and a conversation I had with a planter friend about the same time caused me to put two and two together, and make further inquiries as to the connection between the two diseases.

My planter friend is connected with two estates, one in a district where malaria is rife, and the other where it is almost unknown. A large batch of coolies were sent to the estate where malaria is absent. An outbreak of dengue occurred and many of the coolies were very ill. Later a large number of them were sent to the malarious district, and it was noted that those who had suffered from dengue previously did not suffer from malaria. This seemed very strong corroboration of the idea that some antitoxin was formed in the blood of persons who had suffered from dengue that was antagonistic to the development of the malaria parasite. I then made inquiries amongst my friends, and got some very interesting replies to my queries. I have altogether collected some thirty or forty cases of persons who have either had malaria before contracting dengue who have had no recurrence after the attack of the latter disease, or, on the other hand, have had dengue, and have later been exposed to malaria infection and have proved immune.

(1) Male. Contracted malaria in India. Suffered frequently from attacks. Dengue two years ago. No malaria since.

(2) Wife of No. 1. Case similar.

(3) and (4) Husband and wife. Treated for malaria by Dr. Castellani twelve years ago. Later had dengue. Malaria disappeared.

(5) Lady living in Lahore. Ordered home on account of frequently recurring malaria, in 1916. Unable to obtain passage. Left Lahore for a time and contracted dengue. Had had no further attack of malaria up to August, 1918, since which time I can get no further information.

(6) Chemist. First had malaria ten years ago. Attacks frequent. Three years ago had dengue. No malaria afterwards.

(7) Chemist. Suffered from malaria for three years, then was laid up with "seven-day" fever, which, from the symptoms he described, double fever and rashes, joint pains, specially noticed in fingers, was evidently dengue. This was about two years ago, and he has had no recurrence of malaria.

(8) Reporter. Nine years ago, soon after arrival in Ceylon, had a smart attack of dengue. Since then his occupation has taken him all over the island, to places in the jungle where malaria is rife. He has never taken any precautions, even though sleeping in the jungle—no quinine or any preparation to keep mosquitoes from biting, and has not had the slightest sign of malaria.

(9) and (10) Two healthy men, Government officials, soon after arrival in Ceylon, were going on a shooting expedition in the jungle. It was postponed as one of them—B—contracted dengue. On his recovery they took their trip. They lived under the same conditions, and both were severely bitten by mosquitoes. B has not yet—nearly two years after—had the slightest sign of malaria, whilst his companion became ill with it before returning to Colombo, and has suffered more or less ever since.

The above are a few of the cases that have come under my cognizance, and even they, I think, are sufficient to show that there is more in the theory than just coincidence.

In all my inquiries I have only met with one case which contradicts the idea, and that is the case of a man who says he has had dengue three times and still has malaria—but in giving his description of his attacks of dengue, he states that each time the symptoms were different, and that in no case did he have either a secondary fever or a secondary rash—so it is very questionable if he ever had dengue at all.

Assuming the theory that some ferment is formed in the blood after dengue is correct, the next move is to find how to utilize the theory for the prophylaxis and cure of malaria.

That whatever is formed does not prevent a recurrence of dengue itself is proved by the fact that a second attack can occur within a very short period of time after the first.

My idea was to make an antitoxin in the same way as holds with diphtheria, but I am quite aware of the difficulties in the case of this disease, as the germ of dengue has not been isolated, and it will pass through the finest known filter, and is ultramicroscopic. Also there is the difficulty of inoculating any of the lower animals with the disease. I am informed that the only success that has been obtained in this direction is by the Japanese, who inoculated guinea-pigs. However, there is this to be considered, that dengue, being a disease rarely fatal, perhaps investigations have not been carried out so vigorously as would have been the case had the disease been of more importance.

I am not a bacteriologist, but I presume that a serum, if obtained from a guinea-pig infected with dengue and filtered through the finest known filter, would microscopically appear as pure blood serum, and would contain no other *toxic* organisms, and therefore would not by any chance convey any disease to the person into whom it was injected, but might, and, arguing by analogy most probably would, contain the antitoxin needed to prove my theory correct. If the toxin of dengue is too minute to be recognizable, or to be caught on a filter, surely the antitoxin resultant therefrom would be equally, or even more minute and indistinguishable.

It would therefore be absolutely impossible to prove that this filtered serum contained the antitoxin required otherwise than by experiment on persons suffering from malaria, and as one could practically guarantee that no disease would follow inoculation, I could get several malaria subjects to undergo inoculation, on the understanding that if it did no good it could not possibly do any harm. The procedure I would propose is this: Find a person in whose blood exist malaria parasites. Take a smear of his blood and take a record of the number and kind of parasites seen. Then inoculate him with the vaccine or serum, and ten days later examine the blood again. Whether there is any diminution or alteration in the parasites or not, I would suggest a second dose then, and a month later, if in the interim there have been no malaria attacks, make another examination of the blood. If it should be found that, after an interval of, say six months, provided that the patient has lived under the same conditions, the parasites have disappeared altogether, one would then have fair evidence of the curative properties. Once the efficacy as a curative agent is proved, then comes the trial as a prophylactic. There are places in Ceylon where malaria is terribly rife, but where civil servants and others have to live by reason of their duties. I am quite sure that people could be found who would submit to inoculation on the chance of keeping malaria-proof, and if the result were the same as after dengue in Case No. 8 mentioned above, the value of the remedy would be proved. I may be very sanguine, but I am so fully convinced as to the prophylactic value of an attack of dengue that, if I contracted the disease, I would have no hesitation in allowing myself to be bitten by malaria-infected mosquitoes without fear of becoming infected myself. Also, if the vaccine could be proved to be *curative*, I would be quite willing to have its prophylactic powers tried on myself.

Dengue itself is such a very disagreeable disease to suffer from that it would be difficult to persuade people to be inoculated directly with the disease as a preventive against a possible or even a probable attack of malaria, but once a serum was obtained, I believe there would be little or no trouble in finding persons willing to undergo inoculation.

I would be exceedingly grateful if any practitioners living in districts where dengue and malaria exist would take notes of dengue cases, especially as regards the question of their having had malaria attacks previously or after, and would let me know the result of their inquiries. One point to remember is that dengue is a distinct and well-marked disease, and I have no evidence of other somewhat similar febrile diseases having any effect on malaria, either present or future.

THE EMETINE TREATMENT FOR BILHARZIA DISEASE.

By F. G. Cawston, M.D.Cantab.

An experience of over 300 injections of emetine hydrochloride given to patients whose urine contained the ova of *Schistosoma hæmatobium*, *S. mansoni*, and ova resembling those of *S. bovis*, shows that where the doses are skilfully given and properly regulated, this method of treating bilharzia disease is free from undesirable toxic effect, and is permanently successful in eradicating the infection. Nevertheless, in view of the difficulty in determining slight cardiac depression due to the large doses required by adults, the emetine treatment should be confined to children and young persons, and careful attention paid to the rate of the pulse throughout. Provided undue exertion is avoided, there is no reason for the patient to be treated as a bed-patient, and moderate exercise is useful in determining when the highest dose the patient can comfortably tolerate is reached.

Where only one case is treated at a time, the salt can be dissolved in 1 c.c. of boiling 1 per cent. carbolic acid before being injected into a muscle. At an institution containing thirty-six bilharzia patients ranging from 4 to 16 years of age, I have found it convenient to empty two hypodermic tubes of "tabloid" emetine hydrochloride $\frac{1}{2}$ gr. into a wide-mouthed test-tube containing 48 c.c. of 1 per cent. carbolic acid and dissolve by boiling. In this way I have been able to give twenty-three intramuscular injections in about as many minutes, regulating the dose from $\frac{1}{8}$ to $\frac{3}{4}$ gr. according to age.

I have found rectified spirit a most convenient means of preparing the site of the injection and of cleansing the needles and all-glass syringe. Where the muscles become at all sore during the second or third week, I know of nothing like the hot sea-water bath to relieve the local condition and deal with the fretfulness of the child, but the injections should not be given more frequently than on alternate days.

Age	Disease in years	Emetine HCl in 1 per cent. ac. carb. (intramuscularly)	Antigen reaction	Eosinophiles	Ova
J.T. 17	2	17½ gr. in 17 days	Strong + Negative after 25 days	..	None after 35 days
H.C. 15	1½	12½ gr. in 22 days	Strong +	..	None after 76 days
A.F. 14	7	14 gr. in 31 days	Weak + Weak + and 18 per cent. after 4 days	18 per cent.	None after 67 days
V.F. 12	4	8⅚ gr. in 31 days	Negative Positive and 17 per cent. after 4 days	15 per cent.	None after 67 days
J.C. 15	8	17⅔ gr. in 23 days	Strong +	..	None after 27 days
			Positive and 28 per cent. after 29 days	..	None after 58 days
C.C. 17	8	17⅔ gr. in 23 days	Negative	..	None after 27 days
			Positive and 34 per cent. after 29 days	..	None after 58 days
G.J. 12	½	12 gr. in 24 days	Weak + Strong + and 17 per cent. after 33 days Weak + and 5 per cent. after 77 days	15 per cent.	1 black after 31 days
E.P. 13	1½	13 gr. in 23 days	Weak + Negative and 7 per cent. after 19 days	20 per cent.	None after 16 days
L.S. 12	1½	10 gr. in 22 days	..	..	None after 67 days None after 97 days
C.L. 17	8	18½ gr. in 26 days	..	37 per cent. 16 per cent. after 52 days	1 black after 52 days
R.R. 12	1	9⅔ gr. in 17 days	..	..	1 black after 67 days 3 black after 144 days
P.B. 16	4	14½ gr. in 29 days	Weak +	15 per cent. only	Dead ova after 25 days (grey or black)
S.W. 20	2	18 gr. in 21 days	Strong + Strong +	2·5 per cent. 6 per cent. after 11 days	

As with the antimony treatment, there is always the risk that patients will consider that they have had enough treatment when the macroscopic blood has disappeared from the urine, but an incompletely cured case does not pick up in general condition as is to be expected in all successfully treated cases, and *the hæmaturia will usually recur within three months*. I have already[1] drawn attention to the risks involved by incompletely destroying these larger parasitic worms of the blood-stream, and evidence is accumulating in support of the opinion that the incompletely cured case is particularly liable to attacks of renal colic, the formation of renal calculus, chronic hepatitis, and primary carcinoma of the liver.

If given daily for three days, and then three times a week for three weeks intramuscularly, it is seldom necessary to give more than 1½ gr. at a time. ½ gr. is a sufficiently large one to commence with in a young adult. Children of 10 cannot usually tolerate a maximum dose of more than ½ gr., but show no serious effect from an initial dose of ¼ gr.

Anyone undertaking the care of a bilharzia patient should be provided with a reliable centrafugalizing machine and suitable microscope. Only in this way is one in a position to judge of the effect of treatment, or decide for certain how the dose is to be regulated. It is also of great importance to test the albumen or other evidences of ipecacuanha poisoning towards the end of the month.

Microscopic examination may reveal a mixed infection which might prove of importance. I have found, associated with the ova of *S. hæmatobium*, ova with longer terminal spines measuring up to 0·2275 mm. in length in three young patients living at Sydenham in the Durban suburbs. One of these was a native aged 8, the other two were Natal-born Indian boys.

In some instances the series of injections would appear temporarily to increase the eosinophilia and formation of antibodies; but, in the vast majority of cases treated, the complement-fixation test has proved to be valuable in confirming the results of the treatment, and a negative reaction is generally obtainable under both the emetine and antimony treatments within a month after treatment has been discontinued, provided suitable doses have been given and the solution prepared within half an hour of each injection.

APHIOCHÆTA XANTHINA, SPEISER (*A. FERRUGINEA*, BRUN) AS AN INTESTINAL PARASITE IN THE GOLD COAST.

By A. Ingram, W.A M.S.

Alcock (1920), in giving an account of the Phoridæ, remarks that "the maggots of one species, *Aphiochæta ferruginea*, Burnetti, are becoming almost as well known as intestinal parasites, having

[1] Medical Congress, Capetown, October, 1921.

been reported from Central America, the West Indies, West Africa, India, Burma and China."

Austen (1910) also remarks: "It is evident that *Aphiochæta ferruginea* is very widely distributed in the tropics, since the British Museum possesses examples of it from India, Burma, West Africa, and Central America." It appears, however, that the record from West Africa did not implicate the insect as a parasite of man, as Austen goes on to state: "In Sierra Leone in November, 1904, the species was obtained by Major F. Smith, D.S.O., R.A.M.C., from larvæ feeding in putrid meat." It may, therefore, be of interest to record the fact that this insect does occur as an intestinal parasite of man in West Africa."

We are indebted to Dr. G. E. H. Le Fanu, Saltpond, Gold Coast, for sending us a sample of fæces containing larvæ of this parasite and for furnishing us with clinical notes of the case thus infested. The following are Dr. Le Fanu's notes:—

"Fatima, a Hausa woman, aged 26, was brought to me on account of anasarca. Her heart was not affected, her urine contained no casts but epithelial débris, red blood cells, and ova of *Bilharzia hæmatobium*. Her fæces contained ova of *Ascaris lumbricoides*, and the larvæ forwarded in the sample of fæces enclosed. These larvæ appear to be larvæ of some muscid. I shall be obliged if you will let me have any information you can with regard to them. I have come across larvæ identical with these in the fæces of another case of anæmia due to 'hook' worms."

The specimen of fæces containing the larvæ was posted to the laboratory, Accra, on December 14, the day upon which the fæces were passed. It was not received till December 21, by which time the larvæ had changed to puparia and the fæces had become dry and brittle. Two puparia were mounted in pure carbolic acid; they had lost the anterior three larval segments and showed a T-shaped split on the dorsum. As no trace of a fly could be seen, it was concluded that the flies had hatched and the wooden box (a match-box) containing the fæces and puparia was thrown into a vessel filled with 5 per cent. formalin at 5 p.m. on December 21. At 9 a.m. on the 22nd the match-box was removed from the formalin solution with a view to preserving the puparia permanently. A single puparium was examined in pure carbolic, however, before doing so. It was found to be intact, and the outlines of the fly contained in it could be clearly seen. Promptly the remaining puparia, numbering nineteen, were rescued from the formalin, washed in several changes of water, and placed on moist filter paper in a glass tube. Fourteen flies hatched from the puparia on December 26. Five of these were killed; the others were placed in a glass vessel containing a piece of raw beef. Eggs were noticed on the side of the piece of beef and in the slime oozing from it where it was in contact with the glass within forty hours of the hatching of the flies. The following table gives the cycle:—

December 26, 1921.—Flies hatched some time between 5.15 p.m., December 25, 1921, and 8 a.m., December 26, 1921. Nine placed in a glass vessel containing a piece of raw beef (which was distinctly odoriferous).

December 27, 1921.—Eggs seen at 8.30 a.m.

December 28, 1921.—Larvæ visible at 10 a.m., when contents of the vessel were inspected.

December 30, 1921.—Larvæ active and well grown.

January 2, 1922.—Pupation begun.

January 3, 1922.—All larvæ pupated.

January 11, 1922.—At 8 a.m. five flies had hatched.

Before pupation the larvæ wandered away from the slimy mass on which they had been feeding. Some dry sand was placed at one side of the vessel in the hope that they would avail themselves of it. Some few did, but the majority wandered out of the vessel through the covering of mosquito gauze which had been tied over the mouth of the vessel and up the sides of a bell jar placed over the glass receptacle to prevent access of other flies. The larvæ having chosen a resting place on the inner side of the bell glass gradually took on a yellowish tinge and the boat-like appearance of the puparium; they were found to be adherent to the glass, and were not detached by vigorously shaking the bell jar. The puparia found in the sand were removed from the glass vessel and placed in a small glass tube containing moist filter paper. All these puparia produced flies; it was otherwise with the puparia attached to the inside of the bell jar. The bell jar was removed with its contents and placed upon a piece of dry white paper on the bench at the time that the puparia embedded in the sand were transferred to the glass tube. Three days after these latter puparia had all hatched those in the bell jar were examined; they were found to have turned a dark brown colour, much darker in hue than the colour of the normal puparium immediately before the emergence of the fly. As there did not appear to be much difference in the conditions to which these puparia had been subjected as compared with those in the small glass tube, except lack of moisture, they were brushed off the bell jar with a camel hair brush and placed in a small tube on moist filter paper. No hatching took place, however, up to January 26, when the puparia were transferred to alcohol, it being concluded that all were dead. Apparently, although the puparia may be capable of existing in the human intestine and for some time in 5 per cent. solution of formaldehyde, they do not resist desiccation for a few days.

Dr. Le Fanu kindly wrote to us again with regard to his case after he had been informed that the puparia found in the fæces were in all probability those of *A. xanthina*, Speiser, which, according to Patton and Cragg ("A Text-book of Medical Entomology," p. 307), may cause symptoms simulating those of beriberi. He stated that the woman's condition had greatly deteriorated and

that her friends had taken her home, so that he had lost sight of the case, that whilst the patient was in hospital the anasarca had varied in extent from day to day in the arms, face and legs, but had become very noticeable in the face during her last three days in hospital, the eyes being almost completely closed.

The patient died a few days after being taken home. Whether the symptoms were due to the infestation by larvæ of this insect or were those of moist beriberi Dr. Le Fanu is not prepared to say, as he considers that larvæ of this insect may merely be present accidentally in case of beriberi.

In the other case in which he found these larvæ in the fæces there were no symptoms suggestive of beriberi.

It is to be noted that Patton (1921) places *A. ferruginea*, Brunetti, as a synonym of *A. xanthina*, Speiser.

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The Influence of the Circulatory Alterations upon Experimental Diabetes (Frederick M. Allen, *Journal of Metabolic Research*, vol. i, No. 1, January, 1922).—The author found it possible by operative methods to reduce the arterial supply or the venous drainage of pancreas remnants to a considerable extent, or to increase the arterial circulation to at least a slight extent. All these circulatory changes failed to alter the assimilative function or the pancreatic structure in any way. In particular, they failed to produce vacuolation, "atrophy," fibrosis, or any other specific island changes. The experiments therefore throw no light upon the pathology of diabetes, and afford no support for any circulatory or vasomotor theory of the etiology.

Phenolphthalein Eruptions (Fred Wise, M.D., and E. W. Abramowitz, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 3, March, 1922).—In susceptible persons the ingestion of phenolphthalein provokes a peculiar polymorphous eruption of the skin, with bullous, vesicular and eroded lesions of the mucosæ and genitals.

The cutaneous lesions leave pigmented areas which persist for months and even years. The lesions "flare up" after the ingestion of the drug, usually affecting the same sites as in the preceding eruption. The pigment in the skin does not react to Perles' ferrocyanide test; the cells in the corium are chromatophores and the pigment melanine.

The eruption exhibits many points of similarity to those resulting from antipyrin and arsphenamin.

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THE JOURNAL OF

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MAY 1, 1922.

SIR PATRICK MANSON.

II.

WHEN the writer joined Manson in Hong-Kong in 1887 he found him living with his family "down below"—that is, in the town itself, although in the upper quarters above Chinatown. The Peak district was only coming into repute as a healthy

place to dwell in, and Manson went there on my arrival, and I occupied the house he vacated. It was time he took some care of his health; twenty-six years' residence in the Far East in hot countries, the last ten years actually within the tropics, began to tell upon him. He was subject to severe attacks of gout due to want of exercise, for the early damage to the spine prevented his taking the exercise he should have done, with the result that his walking was much impaired at times, and a trembling of the hands made using the pen a difficulty. Mind and matter were in conflict at this period, and it made leaving the tropics necessary. A typewriter was adopted as his caligraphy had become scarcely intelligible to himself, and his dread of attacks of ill-health more pertinent. In the spring of 1889, what seemed to be a worn-out rather old man, crippled by joint trouble, shaking in hand and head, said farewell to the Far East to take up residence at home. It looked as though his life's story had been told, and one hoped that the veteran was to have his well-earned rest. Far other was the case as we shall see.

Whilst in Hong-Kong Manson paid little heed to Laveran's great discovery of the malaria parasite in the blood. Since 1881 it had been known to the world, but as usual the world paid little heed to it; it was regarded as a curiosity and the discoverer an unknown observer on the northern shores of Africa. The writer being in 1881 an anatomical teacher in London, for instance, never heard of the malaria parasite, and when he reached the Far East in 1887 he was still ignorant of its being, and what is still more wonderful, Manson never even spoke of it, nor referred to it in any way before he left Hong-Kong. This is an incident in the history of tropical medicine which is peculiar and scarcely to be believed, but it is the case that Manson never saw the malaria parasite in the blood before he left China in 1887.

During his stay in China he carried out and advised upon many things in hygiene and sanitation, but the chief cause of disease, the malaria parasite, its presence, behaviour, transmission and elimination, was unrecognized amongst the factors that tended to render the tropics more "unhealthy" to live in.

In 1887 Manson rendered the writer a great service. When on his way out from London to Hong-Kong he had conceived the idea of initiating a medical school for Chinese where Western medicine should be taught locally. He drew up on board ship a scheme founded on the model of a Scottish University, with a rector, a senate, and a staff of teachers. He showed it to his wife, who, acting upon the advice of her husband's medical friends, tried to dissuade him from "more schemes," as it was from the many "side issues" as developed whilst in Charing Cross Hospital that caused his friends to favour him going to the Far East. In this, however, she was over-persuaded, and after the scheme was submitted to Manson, who agreed to be the Dean of the School, the new idea was launched successfully, and on October 1, 1887, the College of Medicine for Chinese was formally opened. Manson's presence as Dean and lecturer on Medicine, with Dr. Hartigan, Dr. Jordan, and other voluntary workers, a complete medical course with botanists, chemists, and with the late Sir Kai Ho-kai, M.D.Aberdeen, Barrister-at-Law, started with twenty-one students, and later under the direction of Dr. C. Thomson, M.D.Edinburgh, the College ran for twenty years, when it became the central pivot on which the present great University of Hong-Kong was founded. Manson, although not the originator of the scheme, was the pivot on which it was founded, moved, and had its being. Without Manson's prestige, influence and patronage the College of Medicine most probably would never have seen the light of day, as neither Europeans nor the Chinese would have been willing to accept the idea of a newcomer, as the writer then was, the Chinese are not constituted that way, but Manson they knew and could trust, and followed his advice with complete confidence.

It was a great ending to a wonderful period of important work for China and the Far East. After a spell of rest at home, "Dr. Manson from Hong-Kong" settled in London and began practice as a consultant in "tropical medicine." Hitherto in private or consultant practice there had been few men who had spent the principal part of their professional life in a warm climate, and who, after retiring therefrom, continued to devote themselves wholly to practice in tropical diseases in England. One or two men who had been abroad for a time dealt with ailments of the kind, but in no instance, except in the case of Sir Joseph Fayrer, Bart., was there any such sustained attempt made. Fayrer, moreover, held the official appointment of Medical Adviser to the Government of India in London, so that he had a focus for his settlement. Manson had not, and at that time in the early 'nineties his name was but little known beyond the Far East even by other medical men in the tropics, for he had not yet become of world-wide fame; in other words, tropical medicine was not a subject which could claim from what was known of it to be a specialty in any sense. However, the venture was made, and success followed it.

About this time a vacancy occurred on the staff of the Seamen's Hospital at Greenwich, and Manson had the good fortune to secure the post of a physician on the staff. At the Greenwich Hospital tropical ailments were congregated in larger numbers than anywhere else in Britain, and here excellent material was to hand for study and investigation. Manson's association with the Seamen's Hospital brought him in contact with a Council and Committee which, by their foresight, desire for the benefit of the seamen of all nations, their ready appreciation of the meaning of the great subject of the study of tropical medicine to the Empire, made them receptive of Manson's ideas of developing a medical school devoted to the study of malaria and other diseases of warm climates.

It was a happy union when the Committee of the Hospital and Manson met, and it was to bear ample fruit in the no distant future, but that moment was not yet. Meantime Manson had taken up the study of Laveran's discovery of the parasitic body he had found in 1881, and which he (Laveran) had pronounced to be the cause of malaria. Manson was not content to let the matter rest there. The importance of the subject caught him in its meshes; to unravel them he devoted himself heart and soul. Gone was the lassitude that characterized his movements when he left the Far East, having spent twenty-six years' unremitting labour there; the trembling hand that reudered writing well-nigh an impossibility was forgotten; at times his old troubles threatened to hamper him, but the burning desire to solve many problems which had been evolving within his active mind carried him over many obstacles, physical and mental; he did what he often advised the writer to do, namely, "set a stout heart to a steep brae (hill)," and he forgot all besides.

Amongst the Committee and executive officers of the Seamen's Hospital Manson found several helpers, but of the many I would specially name two, namely, the Chairman, the late Sir Perceval A. Nairne, and the Secretary of the Hospital, Mr. Michelli, now Sir Pietro J. Michelli, C.M.G. In recounting the progress of the teaching of tropical medicine and the creation of the great school which sprang up these two men's names are worthy of, and for ever will hold, a high place in the chronicles of the great school which they did so much to encourage, to maintain and to establish on a permanent footing. The patience, wise judgment, courtesy, and sound advice of Sir Perceval Nairne was a pleasure to witness, and he guided the infant prodigy through many pitfalls and obstacles of threatening destruction.

The Secretary of that large composite machine, the several charities under the control of the Seamen's Hospital societies, would be more than the average man could deal with satisfactorily, but in addition Mr. Michelli undertook the organization, household and management of a great institution, and contributed largely to bring it to a condition of perfection which has become a world's wonder. Sir Patrick chose his friends well, and they respected him as he served them to good purpose.

Manson had many detractors amongst those who neither knew the man nor had mastered his principles of belief. Sir Joseph Fayrer, Bart., F.R.S., the greatest of the workers in tropical medicine and surgery in his day, on the writer talking to him about the Manson-malaria-mosquito theory, was very dubious and at times sarcastic concerning Manson's ideas of fighting malaria, and he remarked, "As soon try to keep back the wind by a five-barred gate as arrest that great scourge by draining the mosquito swamp."

JAMES CANTLIE.

(*To be continued.*)

Annotations.

Milk-borne Epidemic of Typhoid Fever at Port McPherson, Ga. (Major A. T. Cooper, Major N. F. Curtis, and Major R. Skelton, U.S. Army, *The Military Surgeon*, vol. l, No. 3, March, 1922).—The sanitary control of the dairy and its surroundings, as well as the medical inspection of the workers therein and their families, is probably of greater value than are routine bacteriological analyses in the prevention of the spread of such diseases as tuberculosis, dysentery, typhoid, diphtheria, scarlet fever, and septic sore throat.

The duties of post sanitary officers should include measures to protect, by typhoid inoculation, as many as possible of the civiliaus living on the post.

This epidemic shows conclusively the great value of the typhoid inoculation, especially in cases where the inoculation has been administered withiu three years.

Definition of Experimental Typhus Fever in Guinea-pigs (Peter K. Olitsky, M.D., *Journal of the American Medical Association*, vol. lxxviii, No. 8, February, 1922).—Experimeutal typhus fever presents constantly and regularly certain manifestations which, taken together, stamp it unmistakably as a typical disease. These manifestations have been described as consisting in the guinea-pig of a characteristic febrile reaction, of indefinite transmissibility from animal to animal, particular histologic changes in various organs, but mainly in the brain, absence of bacteria cultivable in any aerobic or anaerobic medium whatever, and finally, immunity, determined by cross-immunity tests, to materials carrying known typhus virus.

Besides these manifestations, which all true samples of typhus fever virus produce, what have been termed "non-specific" or "pseudo-reactions" in the guinea-pig, simulating particular manifestations of the action of true typhus virus, have been described. The latter reactions can be induced with a variety of substances, and the failure to recognize this fact may lead, and, indeed, has already led, to erroneous interpretations of inoculation experiments in guinea-pigs in the course of studies on the etiology of typhus fever.

The Pathology of Diabetes (Frederick M. Allen, *Journal of Metabolic Research*, vol. i, No. 1, January, 1922).—No influence of emotion upon the production of diabetes could be demonstrated in the author's experiments. In one instance a violent general traumatism seemed to activate a latent diabetes, but this effect was transitory.

The Claude Bernard pique of the medulla, selected as the type of an irritative nervous lesion, seemed to be a genuine factor in producing diabetes

in one predisposed dog, thus tending to confirm a previous single result of the same kind; but this question must be left open till some more effective means of stimulation can be employed, and the newer knowledge of diabetes necessitates very strict proof before the existence of an irritative nervous factor in the etiology can be accepted.

Complete separation of a pancreas remnant from its original nerve supply fails to give rise to diabetes or any demonstrable lowering assimilation. The full endocrine potency may apparently be maintained without stimulation or regulation from any special nervous centres.

Such isolation of the pancreas remnant also fails to affect either the occurrence or the rate of hydropic degeneration in the islands, which runs parallel with the course of the diabetes the same as when the nerve supply is left undisturbed.

Intracutaneous Reactions in Lobar Pneumonia (G. H. Bigelow, M.D., *Archives of Internal Medicine*, vol. xxix, No. 2, February, 1922).—Intracutaneous reactions specific for the type of pneumococcus causing lobar pneumonia may be obtained in certain cases. The reaction has not been demonstrated sufficiently early to be of service in directing specific serum therapy. The largest number of reactions occur during the period when, on the assumption of allergy, the highest concentration of antibodies would be expected.

The sensitization responsible for the specific reactions may persist more than two weeks. The most satisfactory antigen for obtaining specific type reactions is made by autolyzing saline solution or distilled water suspensions of the various types of pneumococci.

A reaction, differing from that which is specific for type in time and character, may be obtained in a considerable number of cases of lobar pneumonia and controls. This appears with more than one of the pneumococcus type antigens, and is in no way specific for the type of organism causing the infection. Whether this reaction is specific for a common factor in all types of pneumococcus protein, or whether it is in no way specific for the organisms composing the antigens, has not been demonstrated.

Experiments on Carbohydrate Metabolism and Diabetes (James W. Sherrill and Henry J. John, *Journal of Metabolic Research*, vol. i, No. 1, January, 1922).—Glucose ingestion produces hyperglycæmia attended with oliguria in normal and in diabetic subjects. The accompanying fall in hæmoglobin, red cell volume, and to a less degree in red cell counts indicate a probable hydræmic plethora at the same time, or at least serves to rule out any concentration of the blood rather definitely. The usual fall in the plasma chloride concentration is further evidence in favour of a retention of water in the blood or tissues, or both.

The point which it is desired to emphasize is the apparent dilution of the blood during the period of hyperglycæmia and oliguria in all typical cases. It thus seems possible definitely to exclude the assumption that the oliguria is due to concentration of the blood through the osmotic withdrawal of water from it by the glucose in the intestine.

Another easy assumption has been that glucose acts as a diuretic by its osmotic influence in the kidney. It might thus conceivably increase the quantity of glomerulæ filtrate, or cause water excretion through the tubules, or prevent resorption of water in the tubules, according to the theory of renal function adopted. The experimental facts contradict this assumption, inasmuch as oliguria is typically just as pronounced, or even more so when there is marked glycosuria in addition to hyperglycæmia and hydræmia. Thus, in one case oliguria existed with 2·86 per cent. glycosuria.

In the minority of diabetic cases, especially of the severe group, glucose lacked the above antidiuretic influence, and even served as an active diuretic in accord with former views on the subject, producing polyuria with or without hydræmia. It should be noticed that in no case was the diabetes "total." Only a part of the glucose administered was either excreted during the experimental period or retained in the blood, so that proof is thus afforded of a partial retention of power either to utilize sugar, or at least warehouse it in the tissues. Under these conditions of partial diabetes, it is not surprising that the behaviour toward diuresis was mixed, inclining sometimes toward the normal result, and sometimes toward an abnormality which seems characteristic of diabetes.

Venereal Spirochætosis in American Rabbits (Hideyo Noguchi, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 3, March, 1922).—Of fifty rabbits, otherwise regarded as normal, three adult females and two adult males (10 per cent.) have been found to have in their genito-perineal region certain papulosquamous, often ulcerating, lesions. A recently purchased group of twenty rabbits contained six females (30 per cent.) with similar lesions. This condition runs a chronic course resembling *Treponema pallidum*.

The rabbit spirochæte has the same morphological features as *T. pallidum*; it is possibly a trifle thicker and longer than the average *pallidum*. Long specimens measuring 30 microns are frequently encountered, and they show a tendency to form loosely entangled knots. A stellate arrangement of several organisms in a mass is frequently observed.

In the lesion of one rabbit there were two types of spirochæte, one of the variety just described, the other a somewhat coarser organism, closely resembling *T. calligyrum* found in a human condy-

loma, but a trifle thinner and longer. This organism is perhaps merely a variant type of the rabbit spirochæte.

The histological reactions are similar to, but considerably more cellular, than those occurring in typical primary syphilitic lesions. There is a marked hyperkeratosis and interpapillary infiltration not observed in scrotal chancre.

The disease is transmissible to normal rabbits, in which the usual papular lesions can be readily reproduced in the genito-perineal region. In the first passages the incubation period varied from twenty to eighty-eight days; subsequently one of the strains produced a lesion in twenty days on the second, and in five days on the third passage. No typical orchitis or keratitis was produced in the rabbits of the present series, although in one of the original rabbits scaly, papular lesions have developed on the nose, lips, eyelid and paws. Monkeys (*Macacus rhesus*) failed to show any lesions within a period of four months after inoculation.

In one instance transmission was accomplished through the mating of an infected female with a normal male.

The Wassermann reaction was uniformly negative in the five rabbits with spontaneous lesions and in eighteen rabbits experimentally infected.

Salvarsan had the same therapeutic effect on the lesions produced by rabbit spirochæte as on the experimental pallidum lesion of the rabbit.

The organism belongs to the genus *Treponema*, and may be designated *T. cuniculi*.

The Infective Origin of Anogenital Pruritus (J. M. Winfield, M.D., *Archives of Dermatology and Syphilology*, vol. iv, No. 5, November, 1921).—In over ninety cases of true anogenital pruritus, either the colon bacillus or the *Streptococcus fæcalis* was found on culture. In these, 90 per cent. of cures or relief was obtained by treating the patients with a vaccine made from these cultures. Tineal infection can cause a pruritus of these parts that closely resembles true pruritus.

Further Observations on Treatment of Scarlet Fever with Immune Human Serum (G. H. Weaver, M.D., *Journal of the American Medical Association*, vol. lxxvii, No. 18, October, 1921).—It is well known that the course of scarlet fever is uncertain, some patients suddenly becoming rapidly better under any treatment, and termination by crisis being observed. To one who is familiar with the usual course of this disease, the almost constant fall in temperature, and especially the rapid improvement in the general condition of the patient immediately after the serum is given, is most surprising. Early administration is insisted upon by all who have had experience with the serum. Koch considered convalescent serum an almost absolutely certain weapon during the early stages of the disease.

Intramuscular injections of citrated blood, as recommended by Zingher, may be employed anywhere. When scarlet fever is prevalent convalescents are usually available, and freshly drawn blood may be injected when facilities for obtaining and preserving serum are absent. This makes the procedure practicable in private practice, and in large hospitals for contagious diseases in which suitable convalescents are always available, it would obviate the necessity of collecting and storing the serum. In the absence of available convalescent serum, normal blood may be used.

The Treatment of Psoriasis (Richard I. Sutton, M.D., *Archives of Dermatology and Syphilology*, vol. iv, No. 5, November, 1921).—For several years the author has been gradually discarding the more complicated formulas in the local treatment of psoriasis and depending more and more on chrysarobin. In studying the earlier literature on chrysarobin medication, he found that the pioneers prescribed it in much stronger mixtures than those commonly employed at present. By careful clinical experimentation it was found that a 20 per cent. mixture of chrysophanic acid and petrolatum could safely be applied to one-third, or even more, of the entire cutaneous surface without giving rise to any serious local or constitutional disturbance. The ointment is applied to the patches twice daily by means of a stiff tooth-brush. The patients are, of course, kept in bed, and as a rule they wear a full length suit of union underwear all the time. The eyes are bandaged at night. The average period of confinement is seven days. Following this, only a few remaining patches can be treated and kept covered (to prevent staining of clothing), and arsenic medication begun.

Darier's Disease in the Infant (John A. Borghoff, M.D., *Archives of Dermatology and Syphilology*, vol. iv, No. 5, November, 1921).—Darier's disease is generally understood to be a disease of early adult life, starting usually between the ages of 8 and 20, and extending on beyond middle age. Of those cases which have been reviewed only six have been found to occur in the first five years of life. In the case reported by the author the disease started at the age of 18 months. That heredity plays a rôle in the etiology of the disease seems to have been proven. Trimble in 1912 reported a series of five cases occurring in one family, while Boeck saw it in a father and two sons, and White in a father and a daughter. There is nothing in the history of the author's case to point to an hereditary factor.

McLeod and Omerod mention the affection of the mouth and tongue, but give no description of the lesions occurring there. Nowhere has specific

mention been made of the presence of lesions on the mucous membrane of the anus, nor has it been possible to find a record of the lesions presenting in the auditory canal. Regarding treatment, there is little benefit to be derived from the means now at hand. The Röntgen-ray seems to offer the best chance of relief, which may be but palliative, and is indeed impracticable in very early life.

Clinical and Histologic Features of certain Types of Cutaneous Tuberculosis (Fred Wise, M.D., and D. L. Satenstein, M.D., *Archives of Dermatology and Syphilology*, vol. iv, No. 5, November, 1921).—Of the various forms of disseminated tuberculosis of the skin, the clinical and histopathologic features of two different types have been recapitulated—namely, lupus miliaris disseminatus faciei and the papulonecrotic tuberculids.

In dermatologic literature, the two affections are not infrequently confused. However, they represent entirely different clinical and histopathologic entities. While the pathogenesis of lupus miliaris disseminatus faciei is probably identical with that of other forms of lupus, there is still much to be learned with regard to the pathogenesis of the papulonecrotic tuberculids.

In the light of present-day knowledge, and as a result of numerous experiments and investigations, it is justifiable to assume that the latter affection, as well as the former, is of tuberculobacillary nature, i.e., tuberculosis papulonecrotica.

Significance of the Hæmosiderosis of Pernicious Anæmia (P. D. McMaster, M.D., P. Rous, M.D., and Louise C. Larimore, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 4, April, 1922).—The selective deposition of hæmosiderin in the liver parenchyma in pernicious anæmia does not constitute evidence that there is a hæmolytic cause for the disease located in the portal region. The repeated introduction of small amounts of free hæmoglobin into the general circulation, by the subcutaneous route, leads to an identical siderosis. Larger amounts of hæmoglobin cause a renal pigmentation equalling or exceeding the hepatic, a fact that is in keeping with what is known of the physiology of hæmoglobin excretion and of the findings in human beings after outspoken hæmolysis.

The Renal Elimination of Bilirubin (H. Haessler, M.D., P. Rous, M.D., and G. O. Broun, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 4, April, 1922).—The elimination of bile pigment during jaundice is, for practical purposes, unincreased by diuresis from water by mouth. Possibly, though, the flushing of the kidneys tends to lessen pigment accumulation within these organs and thus to diminish a serious potential source of trouble in long-continued jaundice. Flood diuresis from intravenous injections of salt solution markedly increases the output of bile pigment. It is important to know the effect of variations in the urinary output on the elimination of bile salts, but methods for the purpose are not available at present.

The passage of bile pigment into the kidney cells during jaundice is attested by the presence in the freshly voided urine of desquamated renal elements specifically stained, stippled, or granulated with bilirubin. Pigmentation of this sort is readily to be distinguished from the indiscriminate staining of cellular débris that occurs in icteric urines on standing. It has clinical significance, furnishing direct evidence on the degree of renal change.

The Occurrence of Eggs of Mites in the Fæces of Miners in Cornwall (M. Khalil, *Proc. of the Roy. Soc. Med.*, vol. xiv, No. 8, June, 1921).—The examination of fæces of miners at Camborne showed presence of mites' eggs in ten out of 130. These were allowed to hatch in the laboratory and resulted in adults of *Alcurobius* and *Glycyphagus* sp.

A Protozoan Pathogenic to Mosquito Larvæ (W. A. Lamborn, *Parasitology*, vol. xiii, No. 3, August, 1921).—White opalescent gills were noticed on a batch of mosquito larvæ found in a Malay garden. The microscopical examination showed that these were due to numbers of protozoa, which in some cases had invaded the body cavity as far as the head and antennæ. The protozoa were in active movement and were flagellated. The larvæ, *Stegomyia scutellaris*, ultimately died.

Hæmolytic Action of a Staphylococcus due to a Fat-splitting Enzyme (Marion L. Orcutt and Paul E. Howe, Ph.D., *Journal of Experimental Medicine*, vol. xxxv, No. 4, April, 1922).—A staphylococcus was isolated from milk which is hæmolytic with horse blood only in the presence of fat. Similar results were obtained with two other stains of staphylococci.

The hæmolysis is the result of the action of a fatty acid (or soap) upon the red blood cells. The fatty acid is formed by the action of a lipase elaborated by the staphylococcus.

The corpuscles of different animals show slight variations in the ease with which they are hæmolyzed by the staphylococcus. Attention is called to the desirability of testing for lipases in the study of staphylococcus or of hæmolysis.

The Use of Fish in the Extermination of Mosquitoes (M. E. Connor, *Gac. Med. de Mexico*, vol. i, Ser. 4, August, 1920).—30,000 cisterns, &c., in Guayaquil were freed from mosquito larvæ by the use of fish, the most useful kind being the local *Chalaco*. The fish were distributed by sanitary inspectors from house to house and placed in the cisterns, whether mosquito larvæ were known to be present or not.

Powdered Paraform as a Larvicide (E. Roubaud, *C.R. Acad. Sci.*, Paris, vol. clxxi, No. 1, July, 1920).—The author advocates the use of paraform or trioxymethylene powder as a larvicide specific. The disengaged vapours which exercise the larvicidal power quickly dissolve in water, so that the action, though potent, is transient. The larvæ become immunized to the vapours, although the immunization is transitory. The larvæ after the use of the larvicide have the appearance of paralysed insects.

Study of Blood Sugar Curves following a Standardized Glucose Meal (W. H. Olmsted, M.D., and L. P. Gay, M.D., *Archives of Internal Medicine*, vol. xxix, No. 3, March, 1922).—The basis for the standardization of the technique of the administration of the glucose meal is pointed out. The necessity for such standardization is made clear.

The discussion of the many known factors which influence blood glucose curves shows the importance of the consideration of all of them when such curves form part of any study. The pathological conditions in which the form of blood glucose curve is usually (within certain limits) constant are: (1) hyperthyroidism and hypothyroidism; (2) hypopituitarism; and (3) diabetes mellitus.

There are certain conditions which, in general, show increased curves after the glucose meal. The curves obtained in such conditions do not even approximate the fair degree of constancy found in the above-mentioned conditions. The present knowledge of glycogenic function in these conditions is rather meagre. In this class belong the effects of infectious toxins; those of cancerous origin; those supposedly found in pernicious anæmia and leukæmia; Hodgkin's disease, &c. Here also belong conditions of the mental state. "Functional" disturbances, usually spoken of as neurasthenia, very definitely disturb the height of blood sugar after glucose meal.

The Antidiuretic Effect of Pituitary Extract applied Intranasally in a Case of Diabetes Insipidus (H. L. Blumgart, M.D., *Archives of Internal Medicine*, vol. xxix, No. 4, April, 1922).—In a case of diabetes insipidus under observation, extract of the posterior lobe of the pituitary applied intranasally checked both the polyuria and polydipsia as effectively as hypodermic injection.

Histamin, subcutaneously; lumbar puncture and pituitary extract by mouth, by rectum, and by phenyl salicylate-coated tablets proved ineffectual.

Delayed Cures in the Treatment of Hookworm Infection (K. S. Mhaskar, M.D., M.A., B.Sc., D.P.H., &c., *Archives of Internal Medicine*, vol. xxix, No. 4, April, 1922).—In addition to its immediate vermicidal action, an anthelmintic may also have a remote action on the worms.

This remote action brings about "delayed cures."

Except in proved cases of reinfection, a treatment which is known to be efficient need not be followed by any other.

The Application of Calcium Chloride to Viper Bites (C. Kobayashi, *Japan. Ztschr. f. Dermat. u. Urol.*, vol. xxi, No. 2, February, 1921).—The author treated nine cases of viper bite with a 3 per cent. solution of calcium chloride. Intravenous injections were given daily for six to ten days, the dose containing 20 c.c., with the result that the pain and local inflammation were greatly relieved, and no death occurred.

Chronic Nephritis caused by Lachesis flavoviridis (Tatsuo Suzuki, *Mitt. a. d. Pathologischen Inst. der Kaiserlichen Univ. z. Sendai*, Japan, vol. i, No. 2, 1921).—The author gives a detailed description of the pathological changes which take place in the kidney after the experimental injection of snake venom. The changes in the capillaries of the glomeruli and the chronic nephritis which follows is usually hæmorrhagic. The venom which was introduced intravenously was that of the Crotaline snake, *Lachesis flavoviridis*.

Abstracts and Reprints.

A SEROLOGICAL INVESTIGATION OF ORIENTAL SORE.[1]

By W. H. McKinstry, M.D., D P.H., M.R.C.P.

During the last three years a number of patients suffering from oriental sore attended Queen Alexandra Military Hospital for diagnosis and treatment. Most of the cases had multiple sores, either of the ulcerative or non-ulcerative type, and in many cases both types of sores co-existed. For the reason that the sores were found on exposed parts of the body they frequently presented a more or less symmetrical distribution, which characteristic, coupled with their chronicity, often suggested the question of syphilis.

In the majority of cases of oriental sore the clinical history and the finding by the microscope of Leishman-Donovan bodies quickly decide the diagnosis. But in some cases, more particularly those of the ulcerative type where Leishman-Donovan bodies cannot be found, the question of diagnosis between syphilis and oriental sore becomes of great importance and very great difficulty. And this difficulty may be further enhanced in

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, No. 3, vol. xxxviii, March, 1922.

some cases by a solitary sore involving such a situation as the lip or eye-sore.

Further, the diagnosis of oriental sore from syphilis has been hampered by writers on tropical diseases stating that the blood in some cases of oriental sore has been found to give a positive Wassermann reactiou.

Professor Hewlett, for instance, in his well-known "Manual of Baeteriology," writes: "The reaction (Wassermann reaction) is not confined to syphilis. It may also be obtained (with the antigen employed for syphilis) in leishmaniasis," &c. And Stitt states that "Rabello noted that a positive Wassermann may be present in eutaneous leishmaniasis." Daniels and Castellani and Chalmers, while recognizing the difficulty of differentiating oriental sore from syphilis, fail to mention the Wassermann test as an aid to the diagnosis. The same may be said of Manson. In Daniels' work on "Tropical Medicine" we read: "Syphilis is the disease for which oriental sore is most likely to be mistaken. The absenee of the other symptoms of syphilis and the failure of anti-syphilitie treatment should enable a correct diagnosis to be made"; while Castellani and Chalmers write: "The only way to come to a definite diagnosis in diffieult eases is the microscopieal examination."

From these quotations, culled from recent and standard text-books, it may be legitimately concluded that a great deal of doubt exists as to the valuc of the Wassermann reaction as a clinieal test for the differential diagnosis of oriental sore from syphilis.

Influenced by these eonsiderations, I examined the blood of twenty-eight eases of oriental sore by the complement fixation test aecording to the Wassermann technique used at the Military Hospital, Rochester Row. In twenty-seven of the cases the diagnosis was established by the microscopic findings of Leishman-Donovan bodies. In one case of the series no Leishman-Donovan bodies were found. This case presented many old eicatriees on both legs and arms, whieh, from their clinical history and position, were obviously the result of oriental sores.

Of the twenty-eight cases examined by the Wassermann test only one case gave a positive reaction. This case had points of clinical interest which helped to establish the fact that a positive Wassermann reaction is practically never found in oriental sore without concomitant syphilis. The case, whieh proved the exeeption to the rule, was one with ulcerated oriental sore on the left cheek. Leishman-Donovan bodies were found. The skin on the posterior side of the sore presented an irregularly raised dry sealy appearance, not unlike a ehronic eczema of the beard, and prevented shaving. This condition of the skin was at first thought to be part of the ulcerated oriental sore, and would most likely clear up after the intravenous injeetions of sodium antimonial tartrate solution, the line of treatment pursued.

In this, however, we were disappointed. The sore on the cheek healed and the Leishman-Donovan bodies could no longer be found, but the condition of the skin posterior to the sore remained unchanged. The patient's blood was then taken, submitted to the Wassermann test, and found strongly positive. A few intravenous injections of "914" with mercurial treatment quiekly brought the skin to a satisfactory eondition and confirmed the diagnosis of eoncomitant syphilis, and further anti-syphilitic treatment changed the Wassermann reaction from a strong positive to a negative.

Although these twenty-eight cases might be considered a small number to dogmatize on, I may be permitted to point out the following facts:—

(1) The series includes eases in all stages of the disease.

(2) All the eases, except the one mentioned with multiple scars, were diagnosed definitely oriental sore by the microscopic findings of Leishman-Donovan bodies.

(3) The blood sera from all the cases were examined independently by the Wassermann test at Rochester Row Military Hospital, London.

(4) The findings of the Wassermann reaction were negative in all the eases examined, except the one recorded with concomitant syphilis.

From these findings it may be eonfidently concluded that, in the absence of concomitant syphilis, the Wassermann test never gives a positive reaction in eases of oriental sore.

Medical News.

ROYAL COLLEGE OF PHYSICIANS.

New Fellows and Members.

At a meeting of the Royal College of Physieians, held on April 27, the President of the College, Sir Humphry Rolleston, occupying the chair, the following members of the College were eleeted to the Fellowship:—

H. W. Barber, M.B.; R. A. Bolam, M.D. (Newcastle-on-Tyne); A. Castellani, M.D.; O. L. V. S. de Wesselow, M.B.; A. G. Evans, M.D.; E. H. Greves, M.D. (Bournemouth); A. H. Hayes, R.A.M.C.; C. P. Lapage, M.D. (Manchester); E. J. Maclean, M.D. (Cardiff); J. G P. Phillips, M.D.; Sir Sydney Russell-Wells, M.D.; E. S. Skinner, M.D. (Sheffield); W. H. Wynn, M.D. (Birmingham); and, under by-law XL. (*b*), H. H. Dale, C.B.E., F.R.S., M.D.Camb.

The following eandidates were admitted members of the College:—

J. F. Chambers, M.B.; W. Feldman, M.D., L.R.C.P. and M.R.C.S.; H. Gainsborough, M.B., L.R.C.P. and M.R.C.S.; N. H. Hill, M.B., L.R.C.P. and M.R.C.S.; J. G. Hislop, M.B.; H. MacLean, M.D.; C. T. Maitland, M.D., L.R.C.P. and M.R.C.S.; W. G. Wyllie, M.D.

Original Communications.

REPORT ON HOOKWORM DISEASE IN THE BRITISH SOLOMON ISLANDS.

By NATHANIEL CRICHLOW, M.B., Ch.B.Glasgow.
Acting Senior Medical Officer.

PREVIOUS to the year 1921 no investigations were made in these islands with regard to the prevalence of hookworm disease. No native has ever been treated for hookworm. This may be due to the fact that the natives do not show the clinical picture of the disease.

In the Annual Medical Report for 1915, I stated that I was of the opinion that these natives suffer widely with intestinal parasites. Unfortunately, no systematic examination of the fæces of natives has yet been carried out. This was due partly to want of time on the part of the medical officer, and partly to lack of facilities and equipment.

It was known that Oxyuris and Ascaris were common, but the prevalence of hookworm was not known.

At the invitation of Messrs. Lever's Pacific Plantations, Ltd., and Burns, Philp and Co., Ltd. —the two largest employers of native labourers in these islands—and with the consent and approval of the Protectorate Government, Dr. S. M. Lambert, M.D., of the Australasian hookworm campaign, and two assistants arrived in the British Solomon Islands in October for the purpose of making a hookworm survey of these islands. Messrs. Lever's Pacific Plantations, Ltd., kindly placed one of their inter-island steamers at Dr. Lambert's disposal. As his time was limited to only six weeks, Dr. Lambert confined himself to travelling to as many islands as possible, visiting plantations and villages, seeing for himself the natives and the conditions under which they live, giving lectures, and collecting fæcal specimens for examination.

Dr. Lambert and his assistants left on November 23. His report has not yet been forwarded, and is looked forward to with the greatest of interest.

As a preliminary, one of Dr. Lambert's assistants took specimens from the stools of sixteen (16) native patients of the Government Hospital, Tulagi, and examined them microscopically, using the smear method. Out of these sixteen patients, twelve gave positive results for hookworm, showing an infection rate of 75 per cent.

After Dr. Lambert left I made certain investigations amongst the natives on Tulagi for hookworm. The stools were not examined beforehand, but the natives were treated, the stools were collected for at least twenty-four hours, and a worm count then made.

The following are the results obtained by me:—

DRUG.

Drug used.—Oil of chenopodium supplied by the Hookworm Campaign, Brisbane.

Dosage.—40 minims for an adult native.

Administration.—The drug was given in the morning before breakfast. One hour after the drug was administered, 1 oz. of Epsom salts was given.

WORMS.

Type of hookworm found was the *Necator americanus.*

Other worms found: Oxyuris, Ascaris and Trichuris.

INFECTION RATE.

	Number treated	Number infected	Infection rate percentage
Hospital patients	40	33	82·5
Police constables	77	64	83·0
Prisoners	90	77	85·5
Other natives	26	24	92 0
Total	233	198	85·0

Among the hospital patients, there were twenty-five plantation labourers. Twenty were infected, giving an infection rate of 80 per cent.

INFECTION BY ISLANDS.

	Number treated	Number infected	Infection rate percentage
Bougainville	6	5	83·3
Choiseul	14	13	93·0
Guadacanal	44	39	86·6
Lord Howe	3	2	66·6
Malaita	136	113	83·0
Ngela	2	2	100·0
Rendova	4	4	100·0
Russell Islands	2	2	100·0
Santa Anna	3	2	66·6
Santa Crux	1	0	—
San Cristoval	5	5	100·0
Savo	5	4	80·0
Simbo	2	2	100·0
Vella Lavella	1	0	—
Ysabel	5	5	100·0
Total	233	138	

With the exception of Guadacanal and Malaita, the above figures cannot be taken as the true infection rate for these islands. If Guadacanal and Malaita are excluded and the other islands are grouped together, the infection rate for these other islands is 83 per cent., which can be taken as the representative infection rate for these other islands.

INFECTION BY VILLAGES AND ISLANDS.

The villages are classified into (1) Saltwater; (2) bush.

With the exception of Bougainville, Choiseul, Guadacanal and Malaita, the other islands do not possess bush villages.

	Number treated	Number infected	Infection rate percentage
Bougainville—			
Saltwater	0	0	—
Bush	6	5	83·3
Choiseul—			
Saltwater	11	11	100·0
Bush	3	2	66 6
Guadacanal—			
Saltwater	25	20	80·0
Bush	19	19	100·0
Malaita—			
Saltwater	66	53	80·0
Bush	70	60	86·0
Other Islands—			
Saltwater	33	28	85·0

INFECTION BY VILLAGES.

	Number treated	Number infected	Infection rate percentage
Saltwater ...	135	112	83
Bush ...	98	86	88

It is thus seen that bush villages are more heavily infected than saltwater villages. This is only natural, as natives of the saltwater villages stool on the foreshore, whereas natives of the bush villages stool inland, and so are more liable to be infected. The above infection rate can be taken as the representative infection rate of saltwater and bush villages of these islands.

WORM COUNT.

The easiest method of obtaining the worms for the purpose of a worm count is as follows:—

Take a piece of gauze or butter muslin and fold it into four or eight. The thicker the gauze is folded the less chance is there of any worms escaping. The stools, collected for twenty-four hours, are then washed through the folded gauze until no fæcal matter is left.

The debris is then floated out in a flat basin in water, piece by piece, and the worms picked out and counted.

Maximum number of worms found: 273.

Minimum number of worms found: 1.

The undermentioned table shows the average number of worms found in infected natives for the different islands:—

	Averege number of worms
Bougainville, Bush villages	24
Choiseul, Saltwater ,, ...	16
,, Bush ,, ...	25
Guadacanal, Saltwater ,, ...	30
,, Bush ,, ...	52
Lord Howe	6
Malaita, Saltwater ,, ...	21
,, Bush ,, ...	14
Ngela	6
Rendova	26
Russell Islands	88
Santa Anna	29
San Cristoval	98
Savo	58
Simbo	17
Ysabel	4

Grouping these islands together, the average number of worms found per village is as follows:—Saltwater villages, 27; bush villages, 23.

The twenty-five plantation labourers gave an average worm count of 47. Hospital patients gave an average count of 40.

It is thus seen that these natives are lightly infected with regard to the number of worms.

HÆMOGLOBIN INDEX.

The hæmoglobin index of only apparently healthy natives was taken by means of Talqvist Scale Book.

The hæmoglobin index of hospital patients was not taken, as this would not have given a true representative index. In all cases the hæmoglobin index was taken before the treatment.

In some instances it was found that the hæmoglobin index did not apparently depend upon the number of worms found. Thus, one native with a worm count of only one showed a hæmoglobin index of only 70, whereas another native with a worm count of 125 showed an index of 80. But, if the average worm count is taken, then there is a relationship between the hæmoglobin index and the number of worms as the following table will show:—

RELATION OF HÆMOGLOBIN INDEX AND NUMBER OF WORMS.

Number of infected natives	Hæmoglobin index	Average number of worms
1	95	13
9	90	11
30	85	20
75	80	23
13	75	32
15	70	27
5	60	12

The maximum hæmoglobin index of infected natives was 95; the minimum index was 60.

The maximum hæmoglobin index of non-infected natives was 95; the minimum index was 70.

Non-infected natives gave the following hæmoglobin index:—

Number of non-infected natives	Hæmoglobin index
1	95
4	90
6	85
10	80
4	75
1	70

From the above tables it is seen that the average hæmoglobin index of these natives—infected and non-infected—is 80-85, and that the non-infected natives show a slightly higher hæmoglobin index than infected natives. It would thus appear that hookworm lowers the vitality of the natives to a certain extent.

OBSERVATIONS.

During my investigations I made the following observations:—

(1) A native can take a larger dose of oil of chenopodium than a non-native without showing any toxic symptoms. Twenty minims are sufficient to produce toxic symptoms in a European, whereas no toxic symptoms were noticed in the natives treated and taking 40 minims.

(2) One dose of oil of chenopodium in some instances was sufficient to expel all the worms. In one native the first dose expelled 273 worms. A week later a second dose was administered and no worms were found. He was again treated within a month and no worms were found.

(3) In natives recovering from dysentery, hookworms were not found, or were very few in number when found present.

(4) Very few hookworms were found in association with the Ascaris.

(5) Oil of chenopodium, although it expels the Ascaris, does not kill the worm.

(6) Oil of chenopodium apparently has a direct action on the hookworm and not through the blood.

Conclusions.

From my investigatious I come to the following conclusions:—

(1) Every island throughout the Protectorate is apparently infected with hookworm.

(2) The iufection rate can be taken as 85 per cent. among the natives.

(3) Bush villages show a higher infection rate than saltwater villages.

(4) Whereas the infection rate is high, the worm rate is low and not sufficieut to cause any clinical manifestations.

(5) The fact that 85 per cent. of these natives are infected with hookworm show that the hookworm is apparently a habitant of the intestines of these natives.

(6) The natives are apparently immuned to hookworm, as they are immuned to malaria and septic germs.

(7) Hookworm does not apparently cause much harm in these natives.

(8) Hookworm does lower to a certain exteut the vitality of these natives, but not to such a degree as to become a danger.

Recommendations.

If we can increase the physique and resistant powers of the natives to disease, we ought to adopt every means that will do so. I have seen the physique of some natives considerably improved after having beeen treated for hookworm. By increasiug the physique of the native his working efficiency is also increased. Consequently, if the working efficiency of the natives is improved by only 5 per cent. through treating them for hookworm much good will be accomplished, and the native labour force will become more effective.

This is of the greatest importance to the employer of native labour.

I therefore recommend the following:—

(1) That all indentured natives should be treated at regular periods—every six months—for hookworm.

(2) That all new recruits should be treated before they are sent out to the plantations.

(3) That all time-expired natives should be treated before they are returned home.

(4) That all free natives should be treated where possible.

(5) That natives should be prohibited from stooling anywhere and everywhere, on the foreshore or inland.

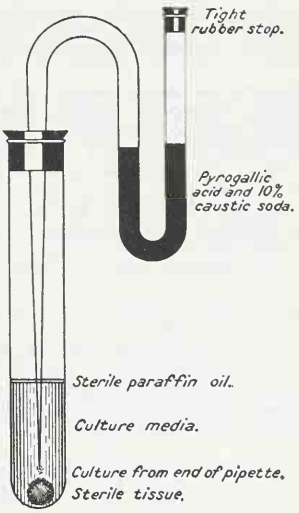
(6) That proper latrines should be erected for natives, such as latrines built over the sea or deep pit latrines.

PSEUDO-LEPTOSPIRA ICTERO-HÆMORRHAGIÆ.

By Ralph W. Mendelson, M.D.

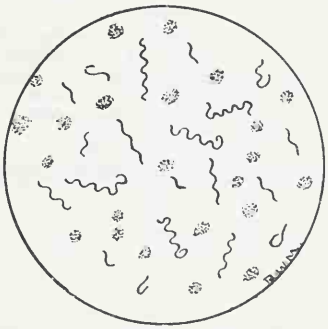
Principal Civil Medical Officer, Royal Siamese Government, Bangkok, Siam.

Although we have never observed a case of infectious jaundice (Weil's disease) in Siam, we have been interested in examining the kidneys of rats caught in the city of Bangkok for the causative



Mendelson Modification of a Noguchi Anaerobic Apparatus.

organism. *Leptospira icterohæmorrhagiæ* Noguchi has been reported as present in the kidneys of rats in America, Japan, Belgium, and also in France, where, as far as the author knows, the disease is



Pseudo-Leptospira Icterohæmorrhagiæ.

unknown, although in the other countries mentioned the disease has also been reported in connection with the exciting cause.

During the last year we have examined the kidneys of 1,483 rats, and have found in eight of the rats examined an organism which morphologically closely resembles *L. icterohæmorrhagiæ* Noguchi. Attempts to cultivate this organism have failed, although we have carefully followed the usual methods. To secure absolute anaerobic conditions we have used a culture tube as illustrated; it is simple and quite satisfactory. The illustration is from a drawing from a kidney smear. This organism varies in length from 5 microns to 30 microns, with from one to six waves, either large or small. Refractile granules have not been noted.

Material from the eight positive rats was used in inoculating laboratory animals. One monkey was injected, but the results were quite negative. Seven guinea-pigs were injected with absolutely no results. They all remained quite well. After varying periods these pigs were killed and examined, and in only one animal were we able to demonstrate the presence of an organism similar to the one injected. We were also unable to cultivate this organism, although present in numbers in both kidneys.

In view of the fact that we have never seen a case of infectious jaundice in Siam and the negative findings as to the pathogenesis of the above organism, we are inclined to consider it as an innocent parasite, and until reported on further would suggest the name "*Pseudo-leptospira icterohæmorrhagiæ.*"

FRESHLY DISSOLVED TARTAR EMETIC IN VENEREAL DISEASE.

By F. G. Cawston, M.D.Cantab.

It has been the custom to send those natives who have contracted venereal disease whilst employed at Durban and are found to be in an infectious condition back to their kraals until the obvious signs of infection are sufficiently faint for them to pass as house-boys or nurse-girls on the Berea. Though the danger of spreading venereal disease in the outlying districts of Natal is very great, the probability is that the majority of these cases recover without treatment other than the uncertain one of the native herbs.

In December, 1921, I offered to undertake the treatment of those natives who were affected with syphilis, provided suitable accommodation could be provided for them for a complete month. However, as no such accommodation could be arranged in Durban, I was obliged to confine my efforts to cases of venereal disease amongst Europeans, most of whom were necessitous cases, who had been refused admission to Addington Hospital on the ground that they were residents within the borough, and therefore entitled to treatment under the department of the medical officer of health, who kindly referred them to me for treatment.

A number of these were severe cases of gonorrhœa and soft sore who had been out of employment for several months, and in some instances were obliged to share a room at a boarding house with one or more companions. Poverty and overcrowding rendered appropriate treatment in their homes entirely out of the question, and one had to rely very largely upon the results of intravenous injections of freshly dissolved tartar emetic solution. The results of this were very gratifying, improvement being evident within twenty-four hours of the initial dose of ½ gr. There was also a great improvement in the general condition of each of these cases right from the start. The cleaning of the soft sores and lessening of gonorrhœal discharge was effected without other form of treatment, one patient who suffered from offensive soft sore and gonorrhœa stating that he commenced to feel easier within half an hour after the first injection. Rapid healing of multiple syphilitic sores that were very offensive when treatment was commenced, and were treated with freshly dissolved tartar emetic solution given intravenously, was reported in the *British Medical Journal* for February 18, 1922.[1]

Although intravenous injections of tartar emetic alone are not sufficient to cure cases of gonorrhœa, they have a very decided value in cleaning up the discharge, particularly in mixed infections. My experience would tend to show that they have an even more decided value in the treatment of soft sore, but here they may be combined with an occasional intramuscular injection of colloidal antimony and sulphur with distinct profit to the patient.

Very encouraging results have been obtained in the treatment of syphilis with freshly dissolved tartar emetic solution. In each case a 4-gr. powder was dissolved in 8 c.c. of boiling saline and from ½ to 1½ gr. injected usually daily, except where it was decided to give a weekly injection of novarsenobillon as well, or an occasional intramuscular injection of colloidal antimony and sulphur, or arsenic and sulphur. It was hoped that the combination of antimony (freshly dissolved) and arsenic, whilst the patient was kept under their continual influence for a complete month, would prove to be particularly efficacious.

In certain conditions this combination of drugs has proved to possess better trypanicidal properties than tartar emetic alone, and in the treatment of nagana in 1920 I advocated alternate injections of tartar emetic and cacodylate of soda to the Veterinary Research Department at Pretoria.

The early effect of intravenous injections of tartar emetic without other forms of treatment which was noted in a case of secondary keratitis in September, 1921,[1] was confirmed in another patient with a strongly positive Wassermann reaction, generalized roseola rash and right-sided keratitis in March. Here the eye-pain disappeared during the day

[1] Cawston, F. G. *British Medical Journal*, February 18, 1922, pp. 266, 267 and 296.

following the initial intravenous injection of gr. ½, and the active signs of keratitis disappeared the day following a dose of gr. ¾ on the third day of treatment.

I have recently obtained similarly successful results in a case of keratitis due to congenital syphilis, which Dr. Lindsay Johnson, the eye specialist, has asked me to treat along the same lines. This case had already received a series of intravenous injections of arsenic without appreciable effect on the eye condition, but the patient stated he could bear the light within three-quarters of an hour after the initial dose of gr. ½, and the condition was certainly subsiding when he returned for the next day's injection of gr. ¾, and the improvement has continued.

Although some cases would appear to respond to intravenous injections of tartar emetic alone, there would appear to be no reason against oral administration of mercury to others. The mercury may be combined with bismuth, in view of the reported value of bismuth in the treatment of syphilis, and a mercury lotion used for the discharging chancre. The appearance of swelling of the gums will suggest an intramuscular injection of colloidal sulphur or a lessening of the dose of mercury; but the very encouraging results of tartar emetic alone suggest that antimony in fresh solution or the colloidal preparations of antimony and sulphur, such as the one Messrs. Oppenheimer, Son and Co. recently produced for me, should be given a very extensive trial in the treatment of venereal disease.

CANCER OF THE LIVER IN THE AFRICAN NATIVE.—FURTHER NOTE.

By A. Yale Massey, B.A., M.D., C.M.
Coquilhatville, Belgian Congo.

In the number of August 15, 1921, I recorded two cases of cancer of the liver in the raw native.

Another case has presented itself in a male native of about 30 years. He had noticed discomfort in the region of the liver for about six months. He was *in extremis* when brought to me, and died the next day. The autopsy revealed a huge nodular liver weighing 11 lb., in every way resembling the two previous cases. The nodules ranged from the size of a large pea to that of a walnut, with soft, broken-down centres of a lighter colour, giving the liver a mottled appearance.

The Imperial Cancer Research, Queen Square, has been good enough to examine a nodule I forwarded, and reports that it would be best described as an adeno-carcinoma and, from the appearance of the cells, probably primary.

The native, like the other two, had in no way adopted the white man's mode of living, although he had lived as a workman in a centre of Europeans for some years. As to locality, Coquilhatville is directly on the equator, and several hundreds of miles from the region of the other two cases.

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THE JOURNAL OF
Tropical Medicine and Hygiene
MAY 15, 1922.

SIR PATRICK MANSON.

III.

In no branch of his life's work did Sir Patrick play a more important part than in the formation of the London School of Tropical Medicine and Hygiene. After taking up residence in London in the early 'nineties, and whilst yet he was becoming

more and more imbued with the truth of Laveran's discovery and the consequences thereof, Sir Patrick by demonstrations of the nature of the blood infections by the parasite to willing listeners at the same time inculcated the possibility of the mosquito being the carrier of the parasite to man. He used the knowledge he had already acquired in this direction from the analogy of filarial infection, and he also taught the meaning of periodicity of nocturnal and diurnal blood flushing impregnated with the parasites, and again their absence from the peripheral circulation. The chaos of these phenomena were by-and-by reduced to something like order by his systematic and well-trained mind. From demonstration to private individuals his teaching took a wider field, and as he became more convinced in his opinions he became more bold in his assertions, and sought more public channels to bring his beliefs before the public. His remarkable paper before the Royal College of Physicians, London, clenched what is now called the mosquito-malaria theory, and henceforward the scientific world no longer cast aside the sayings of what a few years before they had regarded as the ravings of "an addled-brain man from Formosa."

A new basis to medicine, in fact, was being evolved, and the stability of the old régime was being shaken. He was at this time hampered by the absence of clinical opportunity, and he was anxious to get abroad so that he could by clinical and laboratory study settle the questions he had raised. He tried in many ways to get abroad, but matters of finance hampered immediate execution of such a project. He wrote to the writer (J. C.) in Hong-Kong, urging him to come home to London and take his practice there, whilst he himself (Manson) went out to Hong-Kong for, say, twelve months. The writer was very anxious to have Manson back with him in Hong-Kong, but the change of practices could not be so transferred, and the arrangement proposed fell through. Help was sought for from the Government and from the British Medical Association and the Royal Society, and each most generously came forward and promised monetary assistance, but not in sufficiently large amount to allow of the scheme of Manson's going to the West Indies for the purposes of study. Manson at this time had spent a large amount of his capital settling in London; he had a large family being educated; his practice was only as yet begun to gather ground, and he found it impossible to leave it. In the midst of this turmoil of events a young officer of the Indian Medical Service at home on leave, by name of Ronald Ross, sent in his calling card to Manson, and was admitted. He was interested in the subject which was causing some stir in medical circles, and he wanted to learn more about it. Ross had already worked at the microscopy of Laveran's parasite and the appearance of the blood in malaria. Manson found an ardent observer and encouraged him to continue his studies and investigations, and after some anxious beseechings got the Government of India to allow Ross to be seconded for work on malaria. All the world knows the result of that step, after difficulties, some obstruction pursuing attractive side-issues, but still with the great principle kept constantly in view victory was attained, and the mosquito-malaria theory was established for all time on a practical basis. The steps in the scientific investigations are well known and will be dealt with in the next issue of the Journal. The present accounts are more personal in their nature by one who knew Manson well; "family affairs" they might be styled, in fact.

A very important man appeared in tropical medical circles in these early days in London; it was none other than Dr. Louis Sambon, M.D. Naples, one whose name is familiar wherever tropical medicine in its scientific bearings is spoken of. He has been more closely associated with Sir Patrick in his purely scientific work than any other man. With the issue of Sir Patrick's text-book, and in every branch of inquiry, Sambon has studied every step; many of the opinions expressed in the book were handled and dealt with by Sambon. Original; well-nigh prophetic in his beliefs and statements; scientific in his every bearing; saturated with knowledge, he has been a great asset to tropical medical literature to the world in general—to Britain especially. He came to London when he heard of Manson and the development of tropical medicine which was taking place in England. He had worked at maritime zoology in Italy when he was in practice in Naples; in his enthusiasm he gave up his home in Italy and came to London to study at Manson's feet, and for the rest of his life he has worked with and for Manson constantly, devotedly, loyally, as a disciple and friend. Surely never had a man a more ardent and unselfish friend. Sambon was one of the first lecturers in the Tropical School, and still is one of its most valued teachers. He was selected along with Dr. George Low to carry out the famous expedition to the Roman Campagna when the value of the mosquito net and the screened hut was established for all time as a means of preventing malaria in man. He has visited many parts of Europe and America, lecturing, studying, investigating, but it is as a close friend, colleague and coadjutor that we will remember Sambon in connection with Manson, for he has been as Boswell to his Johnson for a score of years.

In common with a few others, Manson had come to the belief that a School of Tropical Medicine had become an Imperial necessity. Whilst the writer of this article was searching London for a place for it, Sambon was doing the same, and Manson was similarly engaged, yet, curiously enough, none of the three communicated their idea to each other. Manson, now at the Colonial Office, as Medical Adviser was unfolding his scheme to the willing ear of the Rt. Hon. Joseph Chamberlain, the master mind at the Colonial Office. He was also enthralling the authorities at the Seamen's Hospital with the possibilities of benefiting the Empire, and,

above all its sailors, seeing that these devoted servants of the Navy and mercantile marine followed the sad trail these tropical diseases left behind in their wake. The first *public* announcement of a hospital and school of the kind was made in 1918, as already mentioned in these reminiscences, at the Imperial Institute, by the writer at a meeting at which Sir Joseph Fayrer, Bart., took the chair. The idea was forging to a head. The enthusiasm of Mr. Joseph Chamberlain, the wisdom and extraordinary foresight and organizing ability of the able men that served on the Council of the Seamen's Hospital, and the genius of Manson, originating, organizing and developing a course of instruction, brought the matter to a climax, and early October, 1899, saw the inauguration. The writer's part in bringing the matter forward ceased when the Government and the Seamen's Hospital Society took the matter in hand. As a matter of history it is perhaps of interest to state that, owing to Sir Patrick's absence on the opening day, the lot of reading his address fell to the writer of this article.

In everything appertaining to tropical medicine in London, Sir Patrick was chosen as the leader. The Royal Society of Tropical Medicine elected him their first President.

He was first President of the newly-formed Tropical Section of the British Medical Association, on which occasion he was given a special meeting for the whole Association at which to introduce to the medical profession the fact that the mosquito-malaria theory had been established by Ross in India, and the news sent home by telegraph a few days before the announcement.

The mention of Sir Ronald Ross's name will form a feature of its own when the Liverpool School of Tropical Medicine comes to be recorded. Sir Ronald had been already planning a school of the kind forming in London. The question really is often discussed: Did the idea of a school occur first to the London or Liverpool people? We have just seen that several people were thinking of the same thing at the same time, as so often occurs in all movements of the kind. Be that as it may, Sir Ronald Ross and the late Sir Alfred Jones did a great work when the Liverpool School was founded, but it is Sir Patrick Manson whose career we have been following in these notices, and to him we have attempted to confine attention as far as possible.

The sketches of the writer are merely those of an intimate friend, not an account of the scientific discoveries that are his. That part of his life's work will be given in the June 15 issue of this Journal, which will be mainly devoted to Sir Patrick Manson, G.C.M.G., F.R.S., LL.D.

Lady Manson has accompanied her husband through all his travels. Her devotion has been very beautiful, and never more so than during the last six months of Sir Patrick's life, when from the nature of his last illness her work has been incessant, as the end threatened many, many times and her life was burdened by constant watching.

Of their two sons, one was a brilliant student of medicine, who, after a close study of tropical medicine in the London School, went to study beriberi in far-distant Christmas Island. He there lost his life, and was conveyed to Hong-Kong and laid at rest in the beautiful cemetery—the "Happy Valley"—of that island in the midst of many of his countrymen. He was the young doctor who volunteered to be bitten by the malaria-infected mosquitoes sent home from the Roman Campagna by Dr. G. C. Low and Dr. Sambon. The power of the mosquitoes proved but too true, for both Dr. Patrick Thurburn Manson and Mr. Warren of the Tropical School both developed acute attacks of malaria in London. The infection was very virulent and lasted a considerable time, and at intervals for a year or two attacks persisted.

The only remaining son, David, followed commercial pursuits.

Of the three daughters, the eldest married Dr. Manson-Bahr, one of our greatest authorities on tropical diseases; a well-known investigator of several ailments—dysentery, sprue, &c.; a physician to the Tropical School Hospital, under the auspices of the Seamen's Hospital Society; and a lecturer on the staff of the London School of Tropical Medicine and Hygiene.

The second daughter, Violet, married Mr. Arthur Steuart-Richardson, of Rhodesia.

The third daughter, Rosie, is the widow of the late Mr. Ian Hossack, of Capetown, S. Africa.

In the Journal of June 15 the scientific aspects of Sir Patrick Manson's life will be dealt with by some of the expert authorities in various phases of the many subjects that engaged Manson's attention, and by them only can the true scientific value of the researches of this master-mind be estimated. There is one phase that the present writer can, however, supply, for he had the unique privilege of seeing the bearing Manson's researches followed in regard to the practice of medicine. Everything he did was done with the direct idea of applying it to practice. The treatment of his patients was the be-all and end-all of his desire. He was a great clinician—a great doctor as well as a great investigator; if ever the two fields met in one man's mind they did so in Manson's. We are familiar today with laboratory workers *and* practitioners, but not a combination of the two; it is assumed to be impossible for a man to do both. Manson has, even in the multitude of duties of both at the present day, proved the assumption to be incorrect, but it will require another Manson to continue to do so. It is to be hoped God in his bounty will give us another.

JAMES CANTLIE.

Annotations.

The Length of Life of Transfused Erythrocytes in Patients with Primary and Secondary Anæmia (J. T. Wearn, M.D., Sylvia Warren, and Olivia Ames, *Archives of Internal Medicine*, vol. xxix, No. 4, April, 1922).—Red blood corpuscles from donors in Group IV transfused into patients in Group II with pernicious anæmia and anæmia secondary to nephritis, remained in circulation longer than has been generally believed to be the case. The last of the transfused red blood cells disappeared from the circulation in from fifty-nine to 113 days, with an average of eighty-three days.

No difference was noted in a series of observations in the duration of the stay of the red blood corpuscles in the circulation between patients with primary anæmia and secondary anæmia (due to nephritis).

In a single observation red blood corpuscles from a patient with pernicious anæmia transfused into another patient with pernicious anæmia behaved as did the corpuscles from normal donors.

Epidemic Prurigo in Annamites in France (W. Dubreuilh, *Ann. de Dermat. et de Syph.*, vol. i, No. 1, 1920).—The author describes an epidemic of pruriginous eruptions in Annamites admitted to Hospital No. 27 during the war which at the time was mistaken for scabies. The eruption appeared on the lower part of the trunk, and consisted of urticarial papules intensely irritating. The eruption spread to the whole body, except the face, hands, feet and genitals. Glandular enlargements were frequent, and a pigmentation was left when the rash disappeared. Treatment consisted of the application of ointment: Sulph. precip., 10 gr.; vegetable tar, 10 gr.; lard, 100 gr.; combined with a daily bath.

The Course of Artificial Infection of Rats with Trypanosoma lewisi (Paul Steffan, *Arch. f. Schiffs u. Trop. Hyg.*, vol. xxv, No. 8, 1921).—Artificial infection of rats with *Trypanosoma lewisi* exhibits an acute and a chronic form. The acute form ends either in the death of the host or in the disappearance of the parasites from the peripheral blood, or changes in the chronic form.

On the occurrence of this change the intensity of infection of the peripheral blood falls steeply, whilst during the chronic stage it falls in a gentle curve, so that gradually the parasites disappear completely from the blood; relapses do not occur.

In the acute stages multiple division is the normal occurrence; instances of unequal longitudinal division are seen at the same time, whilst equal longitudinal division occurs quite rarely.

In the chronic stages multiplication does not take place, and divisional forms are not seen.

Transmission by Insects of Leptomonas Pyrrhocoris (G. Zotta, *C.R. Soc. Biol.*, vol. lxxxv, No. 23, June, 1921).—The author describes experiments in infecting Hemiptera, coleopterous and lepidopterous larvæ, and Diptera with *Leptomonas pyrrhocoris* by inoculation into the body cavity. Attempts to infect the water-beetle, *Hydrophilus piceus*, and the Phasmid, *Carausius morosus*, in the same manner failed. A number of gigantic phagocytes are elicited by the infection.

The caterpillar of the bee-moth is very susceptible, and the infection spreads to the wall and lumen of the gut and usually proves fatal.

Case of Human Coccidiosis detected in the Philippine Islands, with Remarks on the Development and Vitality of the Cysts (Frank G. Haughwout, *Philippine Journal of Science*, vol. xviii, No. 4, April, 1921).—The author describes a case of coccidiosis which occurred in an American chemist, aged 32, who had travelled widely and come in contact with workmen of many parts.

The clinical symptoms were lassitude, occasional nausea, and watery diarrhœa and anorexia. A dull feeling in the stomach was experienced, but no pain was felt. The examination of the stools, which were fæculent, showed presence of epithelial cells and oöcysts of *Isopora hominis*. Blastocystis was also present.

Immunizing and Toxic Agents found occasionally in Filtrates of Typhus-infected Tissues (Peter Olitsky, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 4, April, 1922).—In the filtrates of typhus-infected tissues of guinea-pigs can be occasionally found a substance which produces in these animals thermic reactions, lesions characteristic of experimental typhus, and, less frequently, immunity to later injections of active virus. The general indications are that this substance is not a living organism.

A Parasite resembling Plasmodium falciparum in a Chimpanzee (B. Blacklock and S. Adler, *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 1, March, 1922).—A parasite morphologically indistinguishable from *Plasmodium falciparum* was found occurring naturally in a chimpanzee in Freetown, West Africa. This parasite appears to be the same as that described by Reichenow in chimpanzeos and gorillas, and stated by him to be the human parasite.

Laboratory-bred *A. costalis* fed on this chimpanzee failed to become infected, but crescents were few and ex-flagellation was not observed. Efforts to transmit the infection to two human subjects by subcutaneous and intravenous inoculation failed.

The Chemistry and Clinical Significance of Urobilin (Louis Bauman, M.D., *Archives of Internal Medicine*, vol. xxviii, No. 4, October, 1921).—Urobilin is a reddish-brown substance of uncertain composition. It is apparently a conglomerate of urobilinogen molecules that have been oxidized and polymerized. It is soluble in most of the organic solvents, is resinous in nature, and exhibits fluorescence in the presence of zinc salts.

It absorbs certain rays of the spectrum in the neighbourhood of the B and F lines. With mercuric chloride it forms a reddish compound, the basis of the so-called Schmid test. Urobilin can be reduced to urobilinogen *in vitro* by bacteria.

Studies in Oxygen Therapy: In an Extreme Type of Shallow Breathing occurring in Lethargic Encephalitis (A. L. Barach, M.D., and Margaret Woodwell, A.B., *Archives of Internal Medicine*, vol. xxviii, No. 4, October, 1921).—In two patients with lethargic encephalitis the development of an extreme type of shallow breathing was attended by deep cyanosis and coma. The arterial blood was markedly deficient in oxygen and contained an excess of carbon dioxide.

Inhalation of oxygen greatly relieved the arterial anoxemia, but was without effect on the steady accumulation of carbon dioxide. An uncompensated carbon dioxide acidosis, ph. 7·22, was demonstrated in one case by a carbon dioxide dissociation curve.

The circulation was strikingly improved in the beginning as a result of the relief of the anoxemia. Later, a progressive cardiac failure occurred, apparently related to the carbon dioxide retention.

It is evident that shallow respiration, if extreme, interferes not only with oxygen absorption, but with carbon dioxide retention. It seems probable that a terminal involvement of the respiratory centre in lethargic encephalitis is at times the cause of death.

Note on a Case of Human Infection with Isospora hominis probably originating in the United States (F. G. Haughwout, *Journal of Parasitology*, vol. viii, No. 1, September, 1921).—The author recently discovered a heavy infection with *Isospora hominis* Rivolta 1878 whilst studying the fæces of an American arriving in Manila from the United States. Circumstances connected with the case made it highly probable that the infection was contracted in the United States. The author wishes to call attention to this case, and also to eleven others found in the United States by Koford and his co-workers since 1918, and which seem so far to have escaped comment. In 1918 the author drew attention to the number of cases of human coccidiosis that were being detected in the Eastern Mediterranean area and in troops returned from there. At present little is known of the clinical phenomena and still less of the pathology of "human coccidiosis." The general impression is that the disease is not harmful to the adults who have been observed, but there is no knowledge of its effects on children or on people of lowered vitality.

Studies in Oxygen Therapy: In Pneumonia and its Complications (A. L. Barach, M.D., and Margaret Woodwell, A.B., *Archives of Internal Medicine*, vol. xxviii, No. 4, October, 1921).—The authors observed in all eleven patients with lobar pneumonia, each of whom had an arterial anoxemia at some stage of the disease, and four patients with bronchopneumonia, two of whom had an arterial anoxemia. Ten patients with lobar pneumonia were treated by the inhalation of oxygen. In eight, the blood gas determinations were done before or after the oxygen therapy. Of these, the arterial oxygen saturation was increased in all except one. In four, it was raised to the normal level. Two patients with bronchopneumonia who had no arterial anoxemia were treated with oxygen. In one, the arterial saturation was shown to be increased directly after the inhalation. In the second, analysis twenty-four hours later showed a slight fall in arterial saturation. A true stagnant anoxemia was demonstrated in one of ten cases of lobar pneumonia. In four other cases there was a relative lowering of the venous saturation due to the diminution of arterial oxygen. The difference between the arterial and the venous saturation was generally normal or less than normal, indicating that a normal or increased blood flow is usually present in uncomplicated pneumonia.

The most consistent changes in the clinical condition of the patient were the clearing of the cyanosis and slowing of the pulse. The respiratory rate was sometimes slowed; the mental condition of the patient was frequently improved; the dyspnœa was not usually relieved. Oxygen inhalation for one half-hour was sufficient in the mild or moderate cases of anoxemia to elevate the arterial saturation and cause clinical improvement. In the severe cases, one or two hours was necessary. The effect of a single administration was, in the main, temporary. The effect of repeated and prolonged administration produced persistent beneficial changes in the oxygen saturation of the blood, the pulse, breathing, colour, comfort, and mental condition of the patient. In three patients in whom a condition of acute oxygen want followed the development of pulmonary œdema, the prolonged administration of oxygen resulted in striking clinical improvement, and seemed to avert a fatal outcome. It is believed that oxygen therapy has a rational rôle in the treatment of pneumonia. A convenient effective method of giving oxygen has been developed which does not cause discomfort to the patient.

Studies in Oxygen Therapy with Determinations of the Blood Cases: In Cardiac Insufficiency and Related Conditions (A. L. Barach, M.D., and Margaret Woodwell, A.B., *Archives of Internal Medicine*, vol. xxviii, No. 4, October, 1921).—In a normal man the inhalation of oxygen for one half-hour caused an increase in the oxygen saturation of the arterial and venous blood. In a second normal individual, the inhalation of oxygen for the same period caused a very slight rise in the venous saturation, the arterial saturation not being tested. The pulse was slowed in both cases. No significant changes occurred in the blood-pressure, vital capacity, electrocardiogram, venous carbon dioxide content, or rate of respiration.

In seven cases of cardiac insufficiency an anoxic (arterial) anoxemia was present in all, a stagnant

(venous) anoxemia in all except one. Oxygen inhalation regularly increased the arterial saturation. Where the anoxic anoxemia seemed due to passive congestion and œdema at the bases of the lungs, the arterial saturation was raised to the normal by inhalation of oxygen for one half-hour. In the cases complicated by widespread pulmonary œdema, relief of arterial anoxemia was accomplished in from forty-five minutes to two hours.

Oxygen inhalation increased the venous saturation in all except one case of auricular fibrillation. The elevation of the venous saturation was largely due to the rising of the arterial saturation. In a few cases there was an additional and somewhat permanent increase in the venous saturation that seems best explained on the basis of an improved blood flow resulting from the increased supply of oxygen. The arterial anoxemia of acute and chronic bronchitis, and emphysema, occurring in cardiac insufficiency, was fully relieved by oxygen inhalation. The venous saturation was correspondinly elevated. The relief of the cyanosis and the slowing of the pulse were the outstanding objective changes. The blood-pressure, vital capacity, arterial and venous carbon dioxide content, urinary excretion, and rate of respiration showed no definite changes from short periods of oxygen inhalation. The electrocardiogram showed consistent changes in two cases of right bundle branch block, no change in one uncomplicated case of auricular fibrillation. Subjectively, the patients usually said they felt more comfortable or that their breathing was better, but they were rarely enthusiastic.

Abstracts and Reprints.

ACUTE VERONAL (BARBITAL) POISONING SIMULATING EPIDEMIC ENCEPHALITIS.[1]

By G. B. Hassin and M. S. Wien.

A white woman, aged 33, was admitted to hospital on December 9, 1919, in a somnolent condition. When despondent she took large doses of barbital. In January, 1919, a "large dose," the amount not given, rendered her lethargic for about ten days. A similar incident took place in April. On November 27 she took twelve 5-gr. tablets of "veronal," after which she lapsed into a somnolent state, which lasted more than four days. On December 7 she took six 5-gr. tablets, became lethargic, and was brought to the hospital in a profound sleep, from which she could be aroused with difficulty. When awakened she gave intelligent answers, and talked coherently but sluggishly, falling asleep during the conversation. There was slight ptosis and weakness of the right external rectus muscle, and there was diplopia. The lethargy gradually subsided, having lasted thirteen days.

The tentative diagnosis, before the history was learned, was lethargic encephalitis. A typical picture of the latter, characterized by somnolence, paralysis of some of the eye muscles, fever, and general weakness may be caused by other brain conditions. Tumours or hæmorrhages in the midbrain, especially the third ventricle, syphilitic basilar meningitis, paroxysmal attacks of sleepiness in hysteria and epilepsy (so-called narcolepsies), all may yield the symptoms of lethargic encephalitis.

[1] Abstracted from the *Journal of the American Medical Association*, 1921.

DISSOCIATION OF MICROBIC SPECIES.[1]

By Paul de Kruif.

The observations reported herewith have been made in the course of virulence studies with the bipolar bacillus of rabbit septicæmia (*Bacillus lepisepticum*). The majority of the strains used in these experiments were isolated from pneumonias occurring spontaneously in the normal animal stock of this laboratory. This organism, freshly isolated from the rabbit, grows well on mediums enriched with rabbit blood or serum, but poorly on ordinary mediums. In experiments dealing with the quantitative estimation of virulence dilutions from six- to ten-hour rabbit serum broth cultures were carried out, in plain broth, to 10·9 c.c. of the original culture. Subcultures of dilutions of 10·2 to 10·9 were made in parallel series of 5 per cent. serum broth, and of plain broth.

On incubation, all of the cultures in serum broth grew. On the other hand, growth occurred in the plain broth subtubes from 10·3 or 10·4, but not from higher dilutions. The character of the growth in the plain broth series is strikingly different to that in the serum broth series. The serum broth subtubes, especially those of the higher dilutions, grow diffusely, with little or no precipitate. The organisms in the plain broth tubes grow in clumps and rapidly sink to the bottom of the tube.

When care is taken to plate out the two types in serum agar, subcultures from the granular type persist in their granular character, even when returned to serum broth. Those from the diffuse type grow diffusely, both in serum and in plain broth. The Microbe G (Granular growth) is morphologically indistinguishable from Microbe D (Diffuse growth). The colonies on serum agar of Microbe G are markedly different in appearance to those of Microbe D. This fact makes possible the demonstration that the G and D types pre-exist in the original culture. In a word, the granular growth character is not the result of a mutation of the organisms of the primitive culture, resulting from transfer to plain broth.

Difference in Types.

The most striking biologic difference between the two types lies in their virulence for rabbits.

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxvi, No. 10, March, 1921.

Microbe G has failed to kill young rabbits in dose 10·2 c.c. Microbe D from the same parent culture, subjected to an identical number of transplants on the same medium, killed in dose 10·6 c.c. Rabbits surviving large injections of the low virulent G are resistant to multiple fatal doses of the virulent D.

Both types G and D are agglutinated in relatively high titre by serum from animals immunized with the parent culture (G + D). Serum from rabbits immunized with the pure D culture agglutinates both G and D microbes. On the other hand, serum resulting from G type immunization is much more active against G than against D. These interesting relationships will be discussed fully in the more detailed report to be published later.

Conclusion.

It would seem certain, from the foregoing data, that cultures of the rabbit septicæmia bacillus contain individuals of distinctly different character. These individuals can be dissociated by various methods, and once separated, have so far remained true to type. The facts reported have a direct bearing on the question of microbic heredity and of attenuation. The question at once arises as to whether the G and D varieties co-exist in the primitive material responsible for the natural infections, or whether the G form appears as a mutant shortly after removal from its natural habitat in the host.

EFFECTS OF CHRONIC INTESTINAL STASIS.[1]

By Thomas L. Stedman, A.M., M.D.

The products of digestion and the bacteria and toxins which accompany them are absorbed in the small intestine, cæcum and ascending colon. By the intermediary of the portal vein, they then pass into the liver, which plays in relation to these products a modifying, antitoxic and antiseptic part; a certain number of bacteria and toxins are destroyed or transformed into inoffensive substances for the tissues they are to circulate through. They are then eliminated or destroyed without danger to the excretory organs—kidneys, lungs, skin, thyroid—but the overwork put upon these organs finally ends in irritation, inflammation, destruction of the glandular elements, and their functional insufficiency. Thus a portion of the colon bacilli eliminated by the bile infect the biliary tract, hence catarrhal and calculous cholecystitis. The calculi are due to the precipitation of the bile salts which collect around the desquamated epithelial cells. Injection of the embryonal radicles around the canaliculi, an embryonal tissue which may change into fibrous tissue, explains the origin of biliary cirrhosis without either alcohol or malaria playing any part in the process. This chronic irritation of the liver and gall-bladder may end in cancer of these viscera in susceptible persons, since cancer, here as elsewhere, is prone to develop in chronically irritated organs.

Like the liver, the thyroid transforms a portion of the toxins coming from the intestine, and if the gland is overworked, irritated, or inflamed as a result of chronic stercoræmia, its secretions either diminish or become exaggerated in quantity, hence hypo- or hyperthyroidism. Lane assures us that chronic stercoræmia exercises a marked influence on the pathology of the thyroid, and he considers that the goitre of Basedow's disease, as well as parenchymatous goitres, are frequently the consequence of chronic intestinal stasis. He has shown that colectomy or ileosigmoidostomy modifies the evolution of exophthalmic goitre. This opinion has been corroborated experimentally by MacCarrison. The endocrine glands—suprarenals, hypophysis—have an action on the intestine; on their side, the intestinal toxins exercise an action on the parenchyma of these glands, whose function thus becomes excited or is rendered insufficient by chronic stercoræmia. The skin is pigmented in the flexor folds of the limbs, around the base of the neck, eyelids, perineum, &c.

Chronic stercoræmia may produce chronic mammitis and cystic disease of the breast, according to Pauchet and others, these processes in turn favouring the development of cancer; and this observer states that he has found these women with chronic mammitis or adenoma of the breast suffered from chronic intestinal stasis. Therefore, in surgical affections of the breast it is well to radioscope the digestive tract. It would appear that chronic pancreatitis is frequent in chronic intestinal stasis, and often coincides with angiocholitis and simple or calculous cholecystitis. This chronic pancreatin process, readily recognizable at the time of operation on the digestive tract, may at length lead to cancer of this gland. It is probable that carcinoma of the head of the pancreas is, in most cases, preceded by a period of pancreatitis. The skin eliminated sweat overladen with intestinal toxins, with the result that it becomes thickened in certain areas and as hard as leather. The posterior aspect of the forearms especially is covered with acne, the hair grows in excess on the limbs, and, on the contrary, falls out at the scalp. The sweat of the axillæ is offensive. There is no question but that dysmenorrhœa, amenorrhœa and sterility are common in women with chronic intestinal stasis. Agennesia is the rule, especially in brunettes. It is difficult to say whether this is due to a direct action of the toxins on the ovaries or to the action of these toxins on the thyroid, whose physiological relations with the genital system are so intimate. What is clear is the disturbing action of chronic intestinal stasis on the sexual life of women.

Do the intestinal toxins act directly on the nerves, producing neuralgia, psychic depression, fatigue, or is this general asthenia the consequence

[1] Abstracted from the *Medical Record*, vol. xcix, No. 14, April, 1921.

of the intestinal stasis on the thyroid, suprarenals, and other endocrine glands? It is possible that both modes of action exist, but what is certain is that treatment of the stasis will cause the patient to regain his vitality.

NOTE ON THE HISTO-PATHOLOGY OF A NON-ULCERATED ORIENTAL SORE.[1]

By Lieutenant-Colonel J. W. Cornwall, M.A., M.D., D.P.H., I.M.S.

Though Cunningham, who, in 1884, first noted the presence of a parasite in cells of the dermis in an oriental sore, and James, in 1905, both described sections which they had made, it seems that there is still room for a little clearer understanding of the lesion. The present description is based on sections cut from an oriental sore which was excised with local anæsthesia. The sore was acquired by residence in Rajputana, though it was not noticed by its bearer, a European lady, till about three months after she had left that province to reside in the Nilgiri Hills, where such sores are unknown to arise. It was situated over the olecranon process and was first noticed as a pimple. Attention was called to the spot by a sudden painful prick which she thought had been inflicted by a biting fly, though no fly was seen. This happened in the open air. The pimple slowly enlarged, and several months later caused considerable pain and annoyance. When excised it was about 1·5 cm. in diameter, with a smooth, shiny, non-ulcerated surface. There were two other pimples each 3 mm. in diameter about 0·75 cm. distant from the main lesion on opposite sides, and separated from it by apparently healthy skin.

The main lesion was highly vascular, and blood oozed freely from a capillary puncture made at its margin for diagnosis. Vast numbers of Leishman-Donovan bodies of various forms were found in the smear.

The material was fixed in Zenker's fluid, Bles's fluid, and in a picro-formol-sublimate-acetic mixture, and stained by various methods.

In the formation of an oriental sore the course of events is probably as follows: The parasite is introduced into the dermis by way of a solution of continuity of the epidermis. It is improbable that it can establish itself at all unless it be deposited in the dermis; for not a single cell of the epidermis contained it, not even the prickle cells of the rete mucosum, and it seems likely that the parasite would perish if there were any intact layers of the epidermis beneath the point of its entry. Parasites are not found in the cells of the sweat glands, sebaceous glands, or hair follicles, probably because these are all developed from the Malpighian layer of the epidermis. The mononuclear, endothelial cells found in the papillary layer of the dermis are the breeding grounds of the parasite, and its establishment in the dermis appears to cause them to proliferate. The endothelial cells push their way in all directions, following supposedly the lines of least resistance—that is, mainly towards the surface of the skin.

The fibrous tissue of the dermis is split apart by columns of invading cells and becomes a mere network. New capillaries are formed to meet the requirements of the new tissue. At the same time hair follicles and sweat glands are gradually destroyed by pressure and by interference with their blood and nerve supply. The parasites meanwhile lag much behind the invading front of the endothelial cells, whether it be that they cannot multiply fast enough to keep pace with them, or whether it be that the older cells in the middle of the mass are more suited to their nutritional needs. When the endothelial mass reaches up to the Malpighian layer of the epidermis the nutrition of the whole thickness of the epidermis is affected, the dentate cells and many of the prickle cells disappear, the stratum granulosum cannot be distinguished, and the epidermis becomes reduced to a few layers of horizontally elongated, nucleated cells, covered by a thin stratum corneum and surmounted by a stratum disjunctum. A little more time or a very slight injury will now suffice to remove some of this thinned, protecting epidermis and admit pyrogenic organisms to a favourable nidus in the nodule, and in the process of ulceration which follows the protozoa are destroyed. Ulceration, therefore, is a curative process, though perhaps a crude and painful one. If it were not to occur, the parasites would spread laterally and destroy large areas of the integument.

In the normal dermis, besides the endothelial cells, there are plasma cells, migratory cells, mast cells, and perhaps yet others. Some of these take part in the struggle against the parasite. The endothelial cell is distinguished by a large, oval, faintly staining nucleus with a conspicuous nucleolus and faintly staining cytoplasm. On the whole it resembles a nerve cell from a ganglion. When the cell is parasitized the nucleus becomes shrunken and shapeless and eventually disappears altogether, and the cell seems to be replaced by a bag of parasites. Mingled with the endothelial cells, in a minority in the heavily parasitized area, but in a great majority towards the periphery of the lesion, are smaller cells with a round, deeply staining nucleus. Some of these are plasma cells, others migratory cells. No extravascular polynuclear leucocytes are seen. The parasites do not appear to penetrate any of these cells, or if they do, they are quickly altered and cannot be stained.

Presumably this collection of cells outside the parasitized area had some influence in limiting its extension both internally and laterally. When metastatic nodules arise beyond the area of the main lesion they are due to parasites being shed into lymphatic spaces, and being carried outside the area before they are arrested.

Eosinophilous cells with large granules are entirely absent.

[1] Abstracted from the *Indian Journal of Medical Research*, vol. ix, No. 3, January, 1922.

REPORT OF AN OUTBREAK OF TYPHOID FEVER AT JACOBSTOWN, N.J., AUGUST, 1921.[1]

By Major S. Jay Turnbull,
Medical Corps, U.S. Army.

An outbreak of typhoid fever occurred during the first week of August, 1921, at Jacobstown, N.J. The occurrence of the first case was on August 4. A number of cases developed shortly thereafter, and the peak of the epidemic was reached on August 12, to be followed by a rapid decline in the case incidence.

Prior to the epidemic typhoid fever had been practically absent from the community, and this fact, together with the sudden onset, accompanied by clinical symptoms resembling those of "food poisoning," occasioned some confusion in regard to the character of the infection and delayed its recognition. The nature of the disease was definitely determined by the isolation of *Bacillus typhosus* from the urine and fæces of thirty cases, and further presumptive evidence was furnished by the demonstration of a positive Widal reaction in the blood of seventy of the cases. In view of the similarity of the clinical symptoms, the epidemic character of the infection, and the fact that other febrile diseases were not prevalent in the community at the time, it is believed that positive laboratory findings were obtained in sufficient number of instances to justify the conclusion that practically all of the cases were typhoid fever.

Epidemiology.

The town of Jacobstown, with a population of about 146, is located in an essentially rural district devoted entirely to agriculture. The place has neither public water supply nor municipal sewerage system. It is the practice of each family to obtain its water supply from wells or rainwater cisterns, and to dispose of excreta by means of privies.

No dairy milk is used in this community, the supply for the inhabitants being obtained either from a cow owned by the family or by purchase from the neighbours.

A Harvest Home supper was given on July 27, 1921, and the cases of typhoid fever which occurred during the epidemic were confined to the group of individuals who ate food served at that function. Approximately 400 people were either present in person or consumed some of the food used at the supper. With the exception of a few who came a considerable distance, these people were residents of Jacobstown and the surrounding country. Of the 400 individuals, 199, representing 121 families, subsequently contracted typhoid fever. Further evidence that the supper was the primary source of the infection is furnished by the fact that the disease occurred among those who did not live in the vicinity and were in the town only during the time of the supper, and also among a group of persons who did not actually attend the supper, but ate some of the food which was carried to their homes.

The food served at the supper was prepared by a committee composed of twenty-six women and two men. The menu consisted of cold boiled chicken, chicken salad, mashed potatoes, cottage cheese, sliced tomatoes, cole slaw, apple sauce, cold boiled veal, cold boiled ham, rolls and butter, iced tea, coffee, stewed corn, sliced peaches and milk, ice cream and cake.

On July 26 the chickens were taken to the chapel where the supper was to be served, killed, dressed and boiled in four separate lots. Large furnace kettles were used for cooking the fowls. After boiling they were removed from the kettles, placed in a galvanized iron container, and covered with cloths. The cooking was completed by about 5 p.m. About two hours later the chickens were carved; the breasts, upper joints and legs were served as cold meat, while the remainder was cut into small pieces for the salad. This meat was cut, and while still warm was tightly packed into large agate-ware dish pans, which were placed in an improvised ice-box, where they were allowed to remain until 4 p.m. the next day. After removal from the ice-box the chopped meat was mixed with celery and salad dressing and served at the supper, which took place at about 5 p.m. on July 27.

The work of preparing the chicken salad was performed by ten women and one man. The man and seven of the ten women developed typhoid fever. Of the remaining three women, one showed no clinical symptoms of the disease, and no typhoid bacilli were found in the stools or the urine. The other two presented no clinical signs, but the stools of both were positive for *B. typhosus*. The history of one of these women showed that about eight years ago she nursed a case of typhoid fever. The other woman denied that she assisted with the preparation of the salad, but admitted that she was present at the time and had tasted it.

An epidemiological study, largely by the process of elimination, indicated that in all probability the chicken salad provided an avenue of transmission for the infective agent. On investigation it was found that of the 199 cases only ten individuals denied eating the salad. One of these carried a jar of the salad home, where it was eaten by other members of the family, among whom one case developed. In another case the patient was ill two days prior to the day of the supper, and in this instance the father was a known carrier, and it is probable that the disease was contracted from the parent. Four others did not eat any of the salad but ate some of the cold chicken. One ate supper but did not eat any of the salad. Two denied eating any of the food served at the supper, but these cases gave negative Widal's and negative stools, although they were reported as typhoid fever.

Thirteen persons who did not attend the supper

[1] Abstracted from the *Military Surgeon*, vol. 1, No. 3, March, 1922.

subsequently contracted typhoid fever, but on investigation it was found that they had in each instance eaten some of the chicken salad brought home to them by friends, and had not consumed any other article of food served at the supper.

Of the 199 cases, seventy-three did not drink water at the supper and eighty-six consumed no milk. On the other hand, one group of sixteen persons took only water and ice cream, and none of these developed typhoid fever.

Forty-eight cases occurred in individuals from 45 to 80 years of age. There were fifteen deaths, a case mortality rate of 7·5 per cent.

It was impossible to determine how many of the cases had been protected by antityphoid vaccination. One case was known to have been immunized against the disease, and in this instance the attack was mild.

Jacobstown is located at a distance of six miles from Camp Dix, N.J. The town is without hospital facilities, and, as the limited number of physicians practising in the vicinity were physically unable to cope with the large number of cases, the township of Jacobstown and the State Board of Health requested that assistance be rendered by the military authorities at Camp Dix. This request was granted, and the required personnel and equipment placed at their disposal by the camp surgeon. The most urgent necessity was nursing and hospitalization of the sick. There being no nurses available for this duty at the camp, the chief nurse of the Station Hospital was successful in obtaining a sufficient number from nearby cities. Equipment for a thirty-bed hospital was sent to Jacobstown by trucks, together with sufficient personnel to assist in its establishment. The services of medical officers were made available for the purpose of administering antityphoid vaccine and for the care of the sick. The laboratory of the Station Hospital, Camp Dix, was utilized in the performance of the necessary technical procedures.

The emergency hospital was established in the chapel at Jacobstown, and it is believed that this measure was responsible for the prevention of a considerable number of fatalities. The people of the community have expressed their appreciation in no uncertain terms, and the assistance rendered by the Army has been a factor in the maintenance of the cordial relations which exist between the military and civilian populations.

The close proximity of this town to the camp, and the fact that of the first cases a number occurred among the workers in a dairy furnishing milk to the camp necessitated the immediate initiation of measures to protect the command. The service records of all enlisted men were examined to determine their protection, and all civilians, including the families of officers and enlisted men, were urged to take the antityphoid inoculation. The milk supply was limited to that of the two dairies for the reason that better supervision could be maintained and, furthermore, they were located out of the infected zone. The urine and stools of their personnel were examined for the typhoid bacillus with negative results, and they were all given antityphoid vaccine. Daily bacteriological examinations were made of the milk supply, special attention being directed to the typhoid-colon group. Also a daily laboratory examination was made of the water supply. The town of Jacobstown and vicinity was placed "out of bounds" for the military personnel. No cases of typhoid fever developed among the members of the command at Camp Dix.

Current Literature.

The Indian Medical Gazette.

Vol. LVII, No. 3, March, 1922.

Blackwater Fever as it occurs in the Duars and its Treatment (Suresh Chandra Roy, I.M.S.).—Blackwater fever is endemic in the Duars. One or two cases are met with every year. Whatever the germ of the disease may be, whether malarial parasite or some other special germ, it is seen that the disease is preceded by a malarial attack or attacks, and generally develops in the course of it. It is frequent in the rainy season, which corresponds with the malarial season of the place. No case has been observed during winter; only one case occurred during early November when the cold weather was just starting. The symptoms generally met with are fever, changes in the urine, burning sensation in passing it, jaundice, and sometimes vomiting.

The treatment consists of a preliminary purge of calomel, followed by a soap-water enema if the bowels do not move with calomel. Absolute rest in bed is essential. The following mixtures were used alternately every three or four hours according to the severity of the case:—

(1)	Soda bicarb.	10	gr.
	Soda citras	10	,,
	Pot. acetas	10	,,
	Pot. bicarb.	10	,,
	Liq. ammon. acetat.	2	dr.
	Tinct. strophanthus	5	m
	Aquam ... ... ad	1	oz.

For one dose.

(2)	Extract cassia beareana liq. ...	½	dr.
	Liqr. strychnine	5	m
	Aquam ... ... ad	1	oz.

For one dose.

In addition to above, one pint of saline solution (90 gr. to the pint) was injected every four hours per rectum.

The Dysenteries. Laboratory Records from Mesopotamia (Major F. P. Mackie, I.M.S., and Corporal George Trasler, R.G.A.).—Out of 1,121 stools examined in the laboratory, whether containing blood and mucus or otherwise, and including those from all stages of disease in British and Indians, 20·3 per cent. yielded *Bacillus dysenteriæ* (Shiga), 15·8 per cent. contained *B. dysenteriæ*

(Flexner), and 3·3 per cent. undifferentiated strains.

Of the total successful platings, viz., 443, 51·4 per cent. were Shiga infections, 40·1 per cent. were Flexner infections, and 8·3 were irregular strains from *B. dysenteriæ*. In one consecutive series of 105 stools from acute cases, specific dysentery bacilli were recovered in 59·2 per cent.

B. dysenteriæ dies out quickly from the stools, and disappears when the acute stage of the disease is passed and when the stool becomes fæcal.

The house-fly in Mesopotamia is an active carrier of human intestinal parasites, both protozoal and helminthic, and probably bacterial.

In 6,550 samples of fæces from British sources in all stages of the disease, 19·2 per cent. were found to contain *Entamœba histolytica* or its cysts. The figures from Indians varied from 18·5 per cent. (Basra) to 27·9 per cent. (Baghdad). The proportion of chronic cyst carriers amongst healthy British troops was about 6 per cent., and among healthy Indians about 10 per cent. No evidence was found to show that the common intestinal flagellates were the cause of diarrhœa or dysentery.

An Epidemic of so-called Naga Sore at Unao (Sarup Narain Mathur).—Last year during the rainy season many cases of painful ulcer, round in shape, covered with dirty sloughs and undermined edges, were admitted to the District Hospital, Unao. They went on spreading, and often several ulcers existed on one leg, but all of them were situated on the legs. It was at first thought that the ulcers were due to leishmania, but on staining a slide it was found that the whole field was full of straight bacilli. Having read an article on Naga sore in the *Indian Journal of Medical Research*, April, 1921, the author came to the conclusion that these ulcers were of the same variety as the Naga sore. At the present time (September, 1921) the same ulcers have broken out again, but not in such an epidemic form as last year. At present there are three cases in the hospital; two of them got a slight abrasion while working in some mills at Cawnpore, and the third attributes it to a slight scratch. The ulcers are quite characteristic. The slides taken from them are full of straight bacilli. They stained very easily with carbol fuchsin and methylene blue—the stains available here. It is clear that Naga sore is not confined to Assam only, and the name Naga is a misnomer, as it is found in other parts of India also.

Treatment consists of dressing the ulcer with gauze soaked in copper sulphate lotion, gr. 4 to an ounce.

Note on a Case of Typhus-like Fever occurring at Murree (Major H. C. Keates, M.D., B.S., I.M.S.). —The author describes a case of what he at first thought was typhus fever, occurring in a European lady aged about 55, residing at Murree. However, on reading an article in this journal on Rocky Mountain fever, he came to the conclusion that the case in question resembled Rocky Mountain fever rather than typhus, the points in favour of the former being as follows:—

Altitude: Murree is 7,000 ft. above sea-level. The onset of the fever was gradual. The presence of sore throat. The rash appeared first on the wrists and ankles, and gradually spread towards the trunk. The dusky red and swollen face.

The points against typhus fever are: The isolated character of the case and the absence of any source of infection. The patient had been carried on a bazaar dhandy a few nights before she became ill and possibly might have been bitten by a louse then, but this does not seem at all likely. The absence of the rash on the abdomen and the gradual onset of the symptoms.

Medical News.

April 22 marks the passing of one of the oldest medical weeklies—the *Medical Record*. The final issue as a separate publication appeared on that date, and announcement was made that the *Medical Record* had been sold to, and combined with, the *New York Medical Journal*, which appears semi-monthly.

It is interesting to recall that many of the most important discoveries and developments in the progress of medicine were first announced to the American profession by the *Medical Record*. These include Lister's method of antisepsis; Koch's discovery of the tubercle bacillus and that of tuberculin; the employment of cocaine in eye surgery; the Röntgen rays; the discovery of the antitoxin of tetanus and that of diphtheria; Madame Curie's discovery of radium, and many others.

Correspondence.

DENGUE AND MALARIA: A WILD THEORY.

To the Editor of The Journal of Tropical Medicine and Hygiene.

Not being a medical man, it sounds absurd to try and formulate a theory on the subject of malaria, which is not based on research, but merely casual observation during several years spent in the Federated Malay States, where malaria has been very prevalent.

I first went out there in 1907, and was down with an attack of dengue fever within three weeks of my arrival. My friends consoled me by saying: "Well, anyhow, you should be free from malaria in consequence for some time." This popular fallacy started me wondering how it could have originated, since it appeared to be generally accepted.

Later on I found that the Culex mosquito was generally credited with being the cause of dengue, whilst other varieties of the anopheline type appeared to convey malaria. These two varieties appeared, however, to be antagonistic to one

another, though sometimes found in the same locality. It was more usual for the weaker anopheliue to take refuge from his more powerful enemies amongst the mosquito tribe by living at higher elevatious, generally near ravines (with no great depth of water), the depth of water being of little consequence to the other varieties (breeding in larger swamps, or paddy fields, in which the anopheline were rarely to be found)—or to be on the safe side, let us say—very much in the minority. There is probably good reason for this, as the larvæ of the larger variety will attack and kill the larvæ of the anopheline or weaker variety. I naturally jumped to the conclusion that all one had to do on an unhealthy estate was to transport bucketfuls of the more powerful larvæ and tip them into every likely spot where the anopheline mosquitoes were found to breed, with the hope that they would in time exterminate their weaker enemies.

However, since this appeared to cause considerable amusement and was generally considered impracticable, I carried out in practice the next best thing on an estate which was at one time considered a death-trap, with a death-rate of about 25 per cent., chiefly caused by a malignant type of malaria. Though ankylostomiasis (or hookworm) no doubt contributed very largely towards this serious state of affairs, this estate is now looked upon as one of the healthiest in the district, though it is situated midway between two others which are still rather bad with malaria.

I attribute this change chiefly to the fact that the coolie lines situated on the hills, especially near ravines, were abandoned; new lines of a permanent nature were built *down on the flats*, close to deep water (not necessarily stagnant), but where there were many more mosquitoes than on the hills, including the anopheline, but with a very large percentage of other varieties. One would naturally think that if there were *any* malaria carriers amongst them, that malaria should have continued, unless Nature had provided its own remedy for the evil by giving us other varieties of *benign* non-malaria carriers, which actually supplied the remedy for the disease, by inoculating their victims in some manner with some anti-malaria virus or parasite which had the power of conferring immunity, even if, as I imagine (rightly or wrongly), that the other varieties can actually supply the remedy for those patients who are already full of malaria parasites. Of course, without careful research with a microscope this would be a difficult matter to prove, but my observation goes a long way to convince me that there is something in it, when I have found my own malaria disappear, and also that of numbers of Indian natives, *not* by the help of that very excellent medinine (quinine), but (rank heresy as it may sound) by getting thoroughly well bitten by the other varieties of non-malaria-carrying mosquitoes. On my next visit to the East I intend putting this wild theory to the test with the help of a microscope.

C. F. Lushington, R.F.A.

EMETINE TREATMENT OF LIVER ABSCESS.

To the Editor of The Journal of Tropical Medicine and Hygiene.

Sir,—May I supplement Dr. V. S. Hodson's letter iu your issue of March 1 by a few notes of a case of my own?

A. B., female, aged 23. Vaudeville artiste. The patient arrived from India on December 21. I was called in December 22, and found her suffering from intense pain in the right side with a tender spot about the seventh eostal cartilage. Temperature 103·5° F. Sweating profusely. History of dysentery since previous August, but uo diarrhœa for past three weeks. Gave hypodermic of morphia and warm applications to the side. Next morning diagnosed liver abscess and injected 1 gr. emetine. Suggested hospital, but would not consent, as temperature was down. It gradually rose again, so I gave 1 gr. emetine daily till December 26, when I took her to hospital for aspiration and operation if my diagnosis was confirmed. This was arranged for the following moruiug, but she would not stay in hospital, and returned here the same night. I called in Dr. Grenier, senior physician to the hospital, and he confirmed my diagnosis, aud also approved of letting thc operation idea go by.

The injections of emetine, gr. 1 daily till gr. 12 had been given, were persevered with, and the swelling, which on December 25 had been *visible* at the level of the seventh chondro-costal junetion, had disappeared from sight, though some fluctuation could be felt, and the temperature was remaining stationary.

Before the end of January there was neither pain, swelling, nor fluctuation, and she was able to leave here for home on January 31 with no bad symptoms whatever.

I have not the slightest doubt that this was a case of uncomplicated hepatic abscess due to amœbæ, and Dr. Hodson's letter explains a point I could not quite understand, which is the rise of temperature after emetine administration. The abscess was visible, and fluctuation was marked at first, and in my opinion it is impossible to have found a better case, owing to the position of the abscess, to demonstrate that cure is possible by emetine alone without any surgical interference. I may mention that I had to stop the emetine after gr. 12 because of some quasi-paralytic symptoms appearing in both arms and legs, which disappeared in three or four days.

I have had a letter from the patient dated March 3, in which she states that she is gaining strength daily, and otherwise is perfectly well.

I am, Sir,
Yours faithfully,
R. E. Ingram-Johnson, L.R.C.P.Ed., &c.

Galle Face Hotel,
Colombo, Ceylon.
March 29, 1922.

Original Communications.

A GENUINE CASE OF MALARIAL POLYNEURITIS.

By Ralph W. Mendelson, M.D.
Principal Civil Medical Officer, Royal Siamese Government, Bangkok, Siam.

Polyneuritis of malarial origin is so rare as to justify reporting any cases observed, and for that reason the following case is described. Although the statistics are not available, it is believed that not more than thirty-five or forty genuine cases have been recorded.

Family History.

The family history is quite negative. Father died of unknown disease. Mother alive and well. Sisters and brothers, number not known, are all alive and well as far as patient knows.

Personal History.

The patient is a native Siamese, male, aged 37 years. His occupation has been that of a steersman on a river launch. He drinks moderately of a native alcoholic mixture, but has never been drunk, and states that he has no particular desire to drink. He smokes opium moderately and occasionally indulges in Indian hemp. Is a confirmed cigarette smoker. Had gonorrhœa five years ago, complicated by bubo and later arthritis. Had some peculiar skin disease when a child, but cannot describe same. Says he never suffered from "chills and fever," dysentery or beriberi, diseases easily recognized by the Siamese layman.

Present Condition.

As related by the patient, he first felt ill on February 26. Had a headache, fever and sensation of depression. No history of chills. Gradually the above increased in severity until February 29, when the patient was brought to hospital unconscious. His relatives stated that he had been working previous to his illness, and that the day after his sickness started he had some difficulty in walking and in using his upper extremities. This difficulty gradually increased, or rather, rapidly increased, to such an extent that he could neither walk nor control the movements of his arms previous to his unconscious state. On being admitted to hospital a blood examination demonstrated a severe infection with *Plasmodium falciparum*. The white blood count was 12,000. The temperature was 100° F. Immediate and intensive anti-malarial treatment was instituted: 40 gr. of quinine were given intravenously the first twenty-four hours, after which the patient regained consciousness. Intensive treatment was continued for one week; the blood showed parasites until the sixth day of treatment. One week after patient entered hospital the physical examination revealed:—

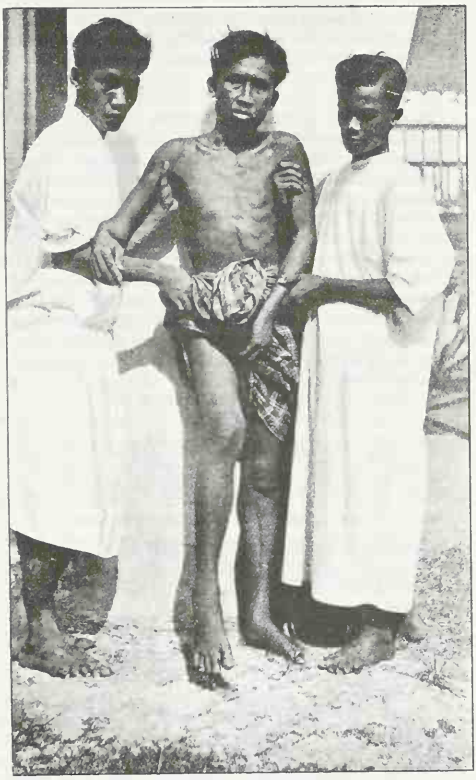
Head and Neck.—Negative.

Thorax.—Lungs negative. Heart revealed a compensating aortic stenosis.

Abdomen.—Liver and spleen normal. The spleen was normal when patient was admitted to hospital.

Muscular and Motor.

Lower.—The paralysis was complete in the lower extremities. Characteristic foot-drop may be noted in the illustration. Patient unable to walk or maintain the erect position unaided. The loss of power was absolute.



Upper.—The upper extremities also affected, but to a less degree. The right arm more affected than the left. Wrist drop complete in right wrist, but not demonstrated in left. Patient able to control movements in both upper extremities, but loss of power marked. The trunk muscles, those of the neck and face, eyes, tongue, respiration, heart and others not affected to an appreciable degree, if at all.

Sensory.

This patient complains of no sensory disturbances. Sensibility to touch, pressure and temperature has as yet not undergone any change.

Reflexes.

The ankle- and knee-jerks are abolished in both lower extremities. The wrist-jerk is present only in the left upper, the right being abolished. The elbow-jerks could not be elicited in either upper extremity. The organic reflexes are not affected.

Other Signs and Symptoms.

There are no mental symptoms, and the only trophic change is a very slight œdema of both ankles. The urine examination is negative.

Remarks.

The diagnosis is correct. It is a text-book case. This case cannot be confused with any other disease of the spinal cord from a clinical view-point. From a laboratory report we find that the Wassermann reaction is quite negative. Beriberi we can rule out from the history of the case, its sudden and severe onset and the finding of *P. falciparum* in the blood. The fact that the patient does drink moderately of alcohol necessarily makes us consider the same as an etiological factor, but in view of the history of the case and the laboratory findings we can feel justified in ruling it out in this case. There is no history of poisoning with lead, arsenic, mercury, silver or ergot.

PASSAGES OF MEDICAL INTEREST FROM THE WEST INDIAN NOTE-BOOKS OF Dr. LOUIS WESTENRA SAMBON.

THE LESSER ANTILLES.

Dr. Sambon visited the West Indies on behalf of the Colouial Office to study pellagra. His researches on this disease have already been published in several Government reports, but his Note-books are full of interesting medical and medico-zoological observations. We propose publishing some of these dealing with the diseases and with the fauna of the West Indies. His notes on the snakes, mosquitoes and poisonous fishes are full of new and interesting data. In this issue we give some passages of a more general introductory nature on the Lesser Antilles and Barbados. Dr. Sambon has over a thousand photographs taken by himself and numerous specimens. Some of these will serve to illustrate his notes.

In visiting the Lesser Antilles—that double string of islets that dot the eastern boundary of the Caribbean Sea—one is struck by the great differences they present in physical features, geological structure, climate, flora, fauna, human inhabitants, economic products and diseases.

The islands of the outer or eastern chain are low and flat, like Barbuda, or somewhat raised and undulating, like Barbados. Together with the Greater Antilles, Central America and the north-eastern parts of South America, they represent the summits of a vast drowned land which, in pre-tertiary epochs, occupied the Caribbean region. Their geological structure, as seen in Barbados, consists of a base of sedimentary rocks (clays, sandstones and coarse conglomerates) in folded, twisted, broken layers, over which lie, unconformably, first bituminous sandstones, clays, shales and grits, then white, red and yellow oceanic deposits, and, above the whole, a great limestone crust or carapace of organic growth. The sandstones and clays are vestiges of an Atlantic continent that was undergoing disruption at the time of their formation. The oceanic deposits—some foraminiferal, others abounding in radiolarians—prove that the whole region, probably in the Miocenic period, was deeply submerged. Finally, the coral-rock shell, built up in successive platforms and containing fossils of species still living, indicates that the subsidence was followed by a discontinuous uplift which, beginning in Pliocenic times and continuing throughout the Pleistocenic period, has now reached, in places, an elevation of nearly 2,000 ft. Each platform represents a stage of upheaval as clearly as each ridge on the shell of a clam marks a successive growth-layer secreted by the mollusc's mantle-edge.

The islands of the inner or western chain are mountainous; they rise out of the violet-blue water thousands of feet high with sharpest slopes all furrowed by the tropical rains, robed in gorgeous verdure and capped with clouds. Some, like Nevis, are isolated pyramids, others a congeries of mountains, crags, valleys, hollows and plains so intricate that nothing could picture them better than the crumpled sheet of parchment by means of which Columbus endeavoured to explain to Queen Isabella the scenic glories of Dominica.

All these islands are volcanic and arose in tertiary time, along a line of faulting caused by the upthrow of a narrow submarine ridge between two subsiding sea basins: the Atlantic on one side and the Caribbean on the other. Some, like St. Vincent, Guadeloupe and Martinique, have given rise to violent eruptions. I need but recall the catastrophic explosions of May, 1902, which occurred simultaneously on St. Vincent and Martinique, and proved again, at the cost of 50,000 lives, that Strabo was right when he told us, nineteen hundred years ago, that neighbouring volcanoes do, at times, intercommunicate.

The type of eruption must have been "Strombolian" in those islands which rise straight out of the sea in the shape of sugar-loaves, or on which great cinder-cones have been piled up, but, within recent centuries, the activity of the West Indian volcanoes has been markedly "Vulcanian," a type characterized by short paroxysms of violent activity separated by long, often centennial, periods of quiescence. Thus, in 1718, the St. Vincent Soufriere blew up its cone and showered it over the

Caribbean region, as Vesuvius had done in *Campania felix* eighteen hundred and forty years ago, when it overwhelmed Herculaneum and Pompeii. After a slight disturbance in 1785 again a tremendous eruption shook the island and destroyed the town of Caracas in April, 1812. The detonations of that terrific outburst were heard as far as South America, and the Barbadians, mistaking them for a cannonade between French and English fleets, hastily manned their batteries. The Dutch did likewise at the Sumatran port of Acheen, in 1883, when Krakatoa suddenly hurled itself bodily into the air, shivered to dust, and, for over a year, crimsoned our sunset skies.

Though some of the Antillean volcanoes have not been active within the memory of man, yet the presence of solfataras and boiling springs, together with the repeated occurrence of seismic disturbances, show that they are only dormant as was Vesuvius during the war of the gladiators, when it sheltered Spartacus and his comrades within its vast amphitheatre. Indeed, some of their craters have become either lakes or bays and the deep blue mirrors within them, surrounded by luxuriant vegetation, look like the eyes of immense peacock feathers. A legend related by Father Raimond, in 1658, shows that the Caribs of Dominica must have seen the " Grande Soufriere " in activity with its steam-canopy illuminated by the glow of molten lava. They told him that a monstrous snake lived in the crater. That it bore on its head a sparkling carbuncle of inestimable value, usually veiled by a thin membrane that acted like the " winker " of a bird. But, when the beast went down to drink, or frisked within its cave, the unveiled gem shone out with fiery brilliancy that set aglow the rocks around and the clouds above.

Whilst the majority of islands composing the group of the Lesser Antilles are either entirely volcanic or entirely sedimentary and follow longitudinally the direction of the chains to which they respectively belong, a few, such as Antigua and Guadeloupe, stretch athwart including both systems. They are conjoined twin islands, but of different geological nature: one volcanic, the other sedimentary. Nowhere is the contrast of the two composing parts more striking than in Guadeloupe, which consists of two nearly equal areas connected by a narrow neck of land, one part, the western, elevated, bristling with craggy peaks, scored with lava flows, abounding in running waters; the other, the eastern, low, flat, arid, sandy, void of streams, fissured with deep crevasses, and honeycombed with underground caves into which the rain sinks rapidly.

The chief beauty of the Antilles is their vegetation. The forest-clad volcanic islands with their bonnets of cloud-chiffon look like Brobdingnagian maidens of the crinoline age, draped in stiff brocades. Each one has its own peculiar tartan of varied greens interwoven with brown, yellow, red, and purple, but there are gala days when some don robes of scarlet. Trinidad ablaze in the vermilion of her " Bois immortels " is a sight never to be forgotten.

In the days of Columbus the Antilles were thickly covered with forests; now the majority have been denuded. Barbados is one great field of sugar-cane with scattered clumps of mahogany trees, which, like the sacred groves of the Roman Campagna, are relics of primitive forest. On the heights of Trinidad, the old wild woods still raise to the sky their canopies of leaves and flowers, and in the crowd of scrambling, struggling plants are giants coeval with those cedars of Lebanon, the timber of which Solomon used to build the Temple.

But deforestation is not the only change that has taken place in the vegetation of the Antilles. Many exotic plants have been introduced from all parts of the world by Caribs, Spaniards, Portuguese, French, Dutch, English and Africans, on account of their edible, medicinal, industrial or ornamental qualities. Who knows not the story of the introduction of the Bread-fruit tree from Otaheite? How, in answer to a petition from the West Indian planters, William Bligh was sent out, in 1718, in command of the *Bounty* to procure Cook's famous bread-yielding plant and ship it to the Antilles; how in Otaheite he collected and potted a thousand young suckers and then sailed westward; how the crew mutinied on their way to the Atlantic and cast their captain adrift in an open boat; how, at the end of forty-one days, Bligh managed to reach the island of Timor and thence return to England; how, again despatched on the same errand, he succeeded in landing hundreds of bread-fruit plants at St. Vincent and Jamaica in 1793.

Besides the bread-fruit tree, Bligh introduced other valuable plants, such as the Otaheitean variety of sugar-cane, which is the kind most often planted now, and the Guinea akee-tree (*Bilghia sapida*), the vermilion fruit of which is a common relish among West Indians, though Dr. Scott believes it to be the cause of " vomiting sickness " in Jamaica.

At what date or by whom certain plants were first introduced into a foreign country is not always known, and when names and dates are mentioned in educational works often they are erroneous or entirely fictitious. Thus, the first introduction of the potato into Europe is ascribed to Sir Walter Raleigh with as much truth as that of the vine to Bacchus or the olive to Hercules. In 1717 the French sent coffee plants to Martinique, but the ship was becalmed and water became so scarce that each man had a very little served out to him. Declieux, who was in charge of the plants, shared with them his own ration and thus one of the plantlets lived to reach the island. It is said that all the coffee trees of the West Indies and Brazils have descended from this single plant. Whether or not this be true, certain it is that the French brought many useful plants to the Antilles, and, indeed, in 1782, one of their ships, conveying nursery stock from the Isle de France (Mauritius) to Santo

Domingo, was captured by Admiral Rodney, who thus became the donor of the mango, of cinnamon, and of other valuable plants to the British West Indies. We know that at the end of the eighteenth century young clove and nutmeg trees were transported by the French from the Moluccas to Mauritius and thence to Cayenne and Dominica, yet, according to Nicolas Monardes (1569), it was Francisco de Mendoza who first introduced clove, pepper and ginger from the East Indies into the West Indies.

The castor-oil plant must have been introduced from Africa into the West Indies very early. It was largely cultivated in Jamaica, and the medicinal oil obtained from its tick-like seeds, greatly valued in antiquity, but almost entirely forgotten by the end of the seventeenth century, was reintroduced into Europe, in 1764, through the commendation of Peter Canvane, a distinguished West Indian physician.

The aloe is another famous medicinal plant. It was the pride of the African island of Sokotra in the fourth century B.C., of Barbados and Curacao in the seventeenth century A.D. Ligon, who visited the island of Barbados in 1647-50, speaks of it as indigenous. I saw the Mediterranean aloe (*Aloe vera*) in the Black-Rock district of Barbados with its glittering pile of gold towering over the clustered fleshy leaves that seemed waiting to be bled. Its bitter juice, inspissated by solar heat or boiling, packed in gourds, and concreted into a dark brown resinous mass with an odour of myrrh and saffron, is one of the oldest known drugs, and the basis of many a pocket-filling nostrum from the famous plague-pill of Rhazes to the present-day liver-pill.

BARBADOS.

A Sapajou Monkey.

At the St. Lawrence Almshouse the only things of interest were a *Petræa volubilis* in the purple of its majestic inflorescence; a woman (a "poor white") suffering from elephantoid fever; and a sapajou monkey that cracked the nuts of a neighbouring crodia-tree by means of a large rounded stone and was debauchedly fond of tobacco. It was certainly laughable to see how the poor beast enjoyed the fumes of the "adorable weed." Someone gave it a lighted cigarette. This it grasped with visible delight, capered up its perch, seated itself comfortably on a strong forked branch, and, holding the burning roll close to the lighted end, began snuffing and inhaling the acro-narcotic vapour. Soon its simian features relaxed into somnolent ecstasy, the pupils contracted, the pale, broad eyelids drooped over the restless eyeballs, and saliva came dribbling out of the half-opened mouth; then the entire frame quivered convulsively, and with all four hands the animal began to stroke, rub and scratch its spine from the back of its head to the tip of its tail. This capuchin monkey had taken to the "saintly herb" as fondly as the tippler lion of the Dublin Zoological Gardens had taken to whisky-punch, which, said the delighted and admiring visitors, it took "just like a Christian."

Burs and Akee Seeds.

After visiting the almshouse, we went to see nearby a man who dragged a huge "Barbados leg." In tramping to his house across a stretch of low waste ground, our clothes picked up hundreds of sticktights and other burs desiring free rides. The Hon. Dr. Philips, who had joined us at the poorhouse, told us of a case of severe conjunctivitis caused by one of these clinging fruits covered with countless barbs and hooks. The patient, a fretful child, presented swollen eyelids and an abundant muco-purulent discharge. For several days Dr. Philips was unable to discover the cause of the trouble by merely attempting to evert the eyelids, but a more thorough examination, under the influence of an anæsthetic, revealed the presence of a small bur in the upper fornix. Dr. Hutson then mentioned cases in which laryngotomy had to be performed in order to remove burs accidentally inspired into the air-passages, and he also told us of a case in which an akee (*B. sapida*) seed had been found lodged in the left bronchial tube of a negro child. I do not remember whether he told us how long the seed had been tolerated. In some cases foreign bodies introduced into the bronchial tubes have been spontaneously expelled after a number of weeks, and beans have even germinated within the air-passages. In Debout's case, a bean, after remaining about a month in the larynx, was expectorated with cotyledons stripped of their seed coat, separated, and presenting a seedling half an inch long. This may not be as surprising as Baron Munchausen's case, a stag, which, two years after being shot at with a charge of powder and cherry-stones, was found with a "fine full grown cherry tree, about 10 ft. high, between his antlers," but it has the merit of being true.

Gun Hill.

Gun Hill is a bluff at the edge of the table-land, with a signalling station perched on its summit, 700 ft. above sea-level. The mast of the aerial telegraph, with Chappe's moving beam across it, is still erect, and many a wireless message has it sent through space, long before Marconi introduced his system, just as the Greek historian Polybius had done with his sets of torches 150 years B.C.

Gun Hill is of interest to the physician because, whenever yellow fever broke out in the island, the garrison troops were marched up its slopes and safely encamped on its wind-swept, mosquito-free summit. Now it is used by the local volunteer forces as a holiday camp.

On the side of the cliff a great lion was cut out of the coral limestone by Col. Wilkinson in 1868. As a work of art it is certainly not comparable to the resting lion sculptured by Thorwalsden in the sandstone near Luzerne, yet, nobly conceived and boldly modelled, it appeals forcibly both to the imagination and to the feelings. Standing with

the terrestrial globe beneath its left paw, the head turned seaward, keeping watch over a mighty battlefield—the Ocean—it is a glorious emblem of Britain's beneficent dominion and recalled to my mind the Greek sentinel lion overlooking the famous battlefield of Chaeronea.

I was told that from time to time the Barbadians whitewash their lion, and I believe my informant regretted that I had not seen it in the full glory of dazzling lime-wash; but a white-faced lion is no emblem of Britain, and I told him I was grateful to Mother Carey, who invariably washed off the unbecoming paint.

The Chigoe.

We drove past sugar fields towards a mahogany wood, the compact, sombre foliage of which was canopied with great fantastic clouds; then, plunging into darkness, we crossed the forest with its undergrowth of "wonder plant," and reached the St. John's almshouse. Here we were received by Dr. W. B. Clarke, who said he had no pellagrins to show us.

In the wards we were shown a severe case of ankylostomiasis in a little girl of six from Colleton, a hamlet beneath the cliff, and several cases of chigoe infestation. Some of the chigoe patients had lost their toes almost entirely, in one of them gangrene had supervened. Never before, except in an African hog, had I seen such heavy infestations. *Dermatophilus penetrans* is a neotropical parasite. The very first travellers who set foot upon West Indian or South American soil soon discovered it beneath and between their very toes. Therefore, all that can be said about and against the chigoe, jigger, nigua, bicho, tunga, jatecuba, pigue, pico, sico, tom, tonor, or aagrani was said in language more or less scientific by sailors, historians, naturalists and physicians of the sixteenth century. I need but mention the famous viceroy of Mexico, Gonzalvo Hernandez Oviedo y Vadez (Historia natural y general de las Indias, Seville, 1535); the Italian traveller, Girolamo Benzoni (Historia del Mondo Nuovo, Venetia, 1565); F. A. Thevet (Singularitiez de la France Antarctique autrement nommée Amérique, 1558); F. Lopez (Historia delle Nuove Indie Occidentali, Venetia, 1576); Zucatus Lusitanus; Julius Cæsar Scaliger; and Girolamo Cardano, a famous Italian physician, mathematician, philosopher, astrologer, and "the wisest fool and most foolish wise man" of his time. From a letter by a Bishop of Panama we learn that, in 1538, a whole division of Spanish troops was unable to move owing to chigoe infestation. A similar misfortune occurred to the French troops under Bazaine in the Mexican expedition of 1863.

The native treatment of dermatophiliasis consists in carefully enucleating and removing the embedded parasite by means of a thorn or needle and filling the little cavity with tallow, annotto, cerumen, or hot ashes. Annotto is the red waxy pulp which coats the seeds of *Bixa orellana*. It is known to us as a colouring matter for milk, cream, cheese and other sophisticated foods, but in tropical America it is more appropriately used to embellish the body and protect it against the attacks of mosquitoes and other parasitic insects. *Cerumen aurium* may seem a strange remedy, but it was used in Europe during the Middle Ages as a remedy for wounds and ulcerations. Of ashes those of tobacco are preferred, sometimes snuff or tobacco-juice is used. When the chigoes are numerous and ulceration extensive, the part is smeared with annotto mixed with carapa oil (obtained from the seeds of *Carapa procera* or those of the mahogany tree, *Swietenia mahagoni*), which is toxic to insects, or with a decoction of a plant of the order Boragineæ known by the name of "Chigoe grass" (*Tournefortia hirsutissima*), or, again, it is poulticed with the leaves of the chigoe grass, the pulp of the sour sop (*Anona muricata*), or the grated root of the bitter cassave (*Manihot utilissima*).

At the Crane Hotel.

The night had already set in when we left the almshouse and the batrachian choristers had commenced tuning their several squealing, whistling, croaking and piping instruments. We were driven to the Crane Hotel, where a cocktail was served in the lounge pending the preparations for dinner.

The cocktail was a mixture of falernum, wormwood, whisky and ice-water, blended and frothed by means of a swizzle stick. The Barbadian "falernum" has nothing to do with the good old wine celebrated by Horace, but is a compound of rum, lime-juice, sugar and egg-albumen. The swizzle-stick is a length of barked twig with a whorl of five spoke-like radiating branches at its distal end cut short enough to form a star that will fit a tumbler or a jug. Revolved rapidly between the palms of the hands, the star-stick, by agitating the liquid and adding to it some of its cambium saponin, whisks it into a pleasant froth. No one seemed to know the origin of the swizzle-stick, and yet its history is very old. Its exact prototype, cut out of a pine branch, was found at Robenhausen, near Zurich. It had been used by Neolithic man, not for a swizzling mixture of ale and beer, or whisky, falernum and wormwood, but to churn milk into butter.

Just as the cocktail was being served a "soldier-crab" came scuttling across the floor in a reeling, drunken way, rattling the stolen helix shell into which it had inserted its unprotected soft abdomen.

We dined exceedingly well at the pleasant Crane hotel, and over our meal we enjoyed a perfect feast of words. Our kind and generous hosts told us many interesting and wonderful things about their island from its earliest days, when imported camels with sneering faces and much grumbling went slowly across the wooden gullies, carrying great burdens of sugar to the bridge (Bridgetown), down to the arrival of the latest London "expert" sent over to teach them how to grow canes, stick gnats, or catch flying-fish. And passing from one thing to another, they told us how one of their colleagues

had made an emergency female-catheter out of a thermometer-case, and how also, emulating Marion Sims with his pewter spoon, a Dr. Greenidge had used a lamp chimney. He might have been the inventor of the tubular speculum had not this instrument been made thousands of years ago by the Hindus from bamboo internodes and the necks of bottle-gourds. Describing tubular specula in the sixth century B.C., Susruta says "they have the shape of cow's teats, and are made of either wood, horn, or soft iron." I have shown that both the tubular speculum and the bladed instrument called diopteron by the ancient Greeks were used in conjunction with mirrors of polished metal. The mirror illuminated and reflected the parts to be examined, after the manner of the laryngoscope, hence the name speculum erroneously given to the divaricating instrument. Specimens of the latter (bivalve, trivalve and quadrivalve) were preserved by the ashes of Vesuvius in its great explosive eruption of August 24, A.D. 79.

The Garfish.

Of the many interesting things we were told, I must mention the case of a soldier wounded by a garfish (*Belone* sp.) whilst bathing. The patient had dived from the pier, and as he tumbled into the water he felt something strike him sharply in the face. Coming out at once he examined his face in a mirror, and noticed a small wound beneath his left eye. After some days a fistula formed and began discharging. Examination by probing revealed a hard foreign body, which on extraction proved to be the jaw of a garfish. One of these voracious Scombresocids must have charged him, and, as is often the case, the fish's long, slender, upper jaw had snapped and was retained in the wound. Not infrequently garfish have been caught with one or both jaws missing, and Mr. Couch, in *Land and Water* of December 8, 1866, mentions a mackerel that had been sent him pierced right through the body by the upper jaw of a garfish which had broken off close to the forehead and was still retained projecting about the fourth of an inch from the wound of exit.

While lying in the harbour of Sabanilla, on the Colombian coast, I had the opportunity of seeing many of these elongated, needle-like fish round the ship, moving lazily, just beneath the surface, now following one another in a line, now moving all abreast. Their backs were of a murky olive green, but their sides shone bluely. I watched them seize bits of food with their long bird-like beaks and deftly turn them lengthways to swallow them.

One species of garfish (*Belone vulgaris*), which is found round the coasts of Britain and France, is quite common in the Mediterranean. I remember eating of it in Naples many years ago, and wondering at the peculiar green colour of its bones, so like the patina on the old Roman bronze coins I used to play with when a boy.

We left the "Crane" late at night. The waves were noisily lashing the cliffs of hard coral limestone, and foaming round the fallen masses as they have done ever since the reef structures rose above the sea.

The Manchineal.

St. James's Church is the oldest in the island, and has a bell bearing the inscription: "God bless King William—1696." It is surrounded by white-cedar, fustic, mahogany and flamboyant trees, crotons, and hibiscus bushes. At the foot of the garden, all along the shore, runs a belt of manchineal trees (*Hippomane mancinella*), with shining dark-green leaves and fragrant fruit, the latter not unlike crab-apples in shape and size. Like the celebrated upas tree of Java, the manchineal is a poison-tree of the Spurge family, and no one, save Oceanus, dare sleep beneath its branches. According to an old popular belief, reported by Labat, in 1724, crabs and fishes become poisonous through eating the fruit of the manchineal. The acrid milky juice of the plant is certainly a virulent and blistering agent, and was used by the Caribs in the preparation of arrow poison. Now the Barbadians collect the fruits and dry them to use as fuel. Whilst burning they give off a pleasant aromatic odour.

Stone Filters.

In the garden we were shown one of the large stone filters commonly called "dripstones" so largely used throughout the island when the water supply was entirely derived from surface ponds. They were made from the more porous portions of the soft oolitic freestones locally known by the name of "sawstones," being soft enough to be cut with a saw when first taken from beneath the surface crust. Large, conical blocks of this soft coral rock were scooped out into wide pitchers or cup-shaped basins. They soon hardened by exposure to the air and made excellent filters.

Sharks.

Beneath a high perpendicular cliff, a continuation of the great escarpment of raised reef-rocks which sweeps round the Scotland district, we were shown a "yellow-fever house," one of those fatal dwellings where all who enter during an epidemic are attacked, and where the disease almost invariably recurs at every fresh outbreak. It was placed at the mouth of a narrow gully containing pools of water teeming with the larvæ and pupæ of Ædes mosquitoes. A little further on, across a field of sugar-cane, was a solitary cabin where pellagra had killed "de prettiest black gal in de wul." In the cabin we found some children playing at hide-and-seek, and a young woman, on a bed, nestling in her arms a tiny copper-coloured baby a few hours old. Whilst we were talking to the "puerpera," the mother of the deceased pellagrin-girl came in. She told us that her daughter was about 14 years old when she died on September 12, 1912. Describing the illness in her quaint jargon, she said: "Both han's an' both feet go black, fus' one han' den d'udder, den one foot den d'udder. De bowel was eber spendin'. She had no spittin', neber had

anything else like dis before. It killed Clotilde quick one time."

We left the old mother and the young mother both smiling on the "moonshine baby," one sadly, the other joyfully, and we walked to the "Landlock," where we watched negro fishermen dive for sea-urchins. It is a dangerous occupation, because Carchariid sharks infest the water round that crumbling rocky coast, and the poor divers often rise to the surface bleeding and fearfully mangled, or, uttering a piercing shriek, vanish, and are never seen again. It was not yet a month since Dr. Massiah's surgical skill had been required to save the life of two young fellows wounded by sharks, one in the arm, the other in the leg. Both had been pursued into the very surf and were caught whilst leaving the water. In 1912 he had been summoned hurriedly to see a man whose leg had been almost torn off by shark bite. Such accidents are by no means infrequent, yet they do not deter the dusky fishermen from seeking a livelihood in the treacherous element. Indeed, noble deeds of heroism are of common occurrence, and Dr. Massiah told us of a negro who, seeing a boy seized by a shark, straightway plunged into the sea, and swimming fearlessly towards the savage monster, succeeded in rescuing the maimed and bleeding lad, whose left leg had been snapped off below the knee-joint.

The shark is the most formidable of fish. The long, flexible body with its snake-like movements, the ugly pointed snout, the small, round, green, grim eyes and large, ventral mouth with terrible array of erectile triangular teeth, the swiftness and stealth, voracity, boldness and ferocity, and its ominous attendance upon plague-ship, slaver and life-raft, have made it a dreaded foe.

The velocity of the shark in water is so great that, once in pursuit, nothing can escape it. Dashing furiously upon its prey it seizes and devours it. Human beings are seldom, if ever, swallowed entire; but instances are numerous of swimmers in tropical seas having been severed in two by the monster's merciless jaws. The majority of persons that have been rescued from sharks had lost either a leg or an arm, the fish having torn off the limb at a single snap. Seldom a man escapes out of a shark's grip without severe injury. He remembers having been suddenly seized, and as suddenly released once, twice, maybe three, different times before being rescued. He is fearfully mangled, presenting extensive lacerated, irregular wounds, with muscles and integuments often stripped down to the bone and hanging in shreds. About the main seat of injury several deep, punctured wounds, corresponding to the size of the shark's teeth, mark the first grip of the awful mouth that is man-trap and guillotine combined. Naturally, these terrible injuries are often fatal; they are always followed by intense prostration due to shock and hæmorrhage.

To the naturalist the shark undoubtedly is a very interesting animal. I need but mention its long known association with pilot-fish (*Naucrates*) and sucking-fish (*Echineis*), and the parental habit of mouthing its young at the approach of danger, a habit which it has in common with many other fish. Yet, on account of its dangerous nature and the dread it inspires, one would like to see shark-liver oil entirely replace whale-oil, the green shagreen of our old spectacle and instrument cases supersede once more kid, porpoise and hog leather, and the excellent shark's fin soup of the Celestials take the place of green turtle soup at aldermanic banquets.

Native Remedies.

In some of the cabins I had the opportunity of noticing peculiar methods of native treatment. One woman I found smearing kerosene oil over her little boy's navel to cure the "belly-ache." The same remedy is used in Sicily under the name of "oil of the Madonna of Pitralia (a corruption of the word petroleum) for uncinarial gastralgy. A young mother was squirting milk from her goat-like breast into the conjunctival sacs of her infant to wash out the muco-purulent discharge of a gonorrhœal ophthalmia, a method of treatment recommended in England by John Arderne, a physician contemporary of the poet Chaucer. Another mother, a proud, swarthy Juno, was rubbing a mixture of castor-oil and rum into the crisp hair of her six years old girl. An emaciated negro boy was sipping orange-peel tea to arrest a flux of the belly. A talkative old lady, who complained much of sleeplessness, told me she had placed the anti-spasmodic leaves of the sour sop beneath her pillow to get some rest, and surely her remedy was more reasonable than the placing of the fourth book of the Iliad under the patient's head, a cure for quartan ague recommended by Quintus Serenus Samonicus in the third century of our era. A middle-aged, light-coloured woman had plastered her right cheek with a leaf of the cotton plant, smeared with tallow-candle grease, as a remedy against toothache. With us, butter and sliced rotten apples are applied for the same purpose. Many of the children wore strings of glass beads, castor-oil beans, or scarlet Jumby seeds round the neck to protect them from fevers and all manner of ills. A necklace made of horsehair from a stallion's mane or tail makes the neck grow strong and graceful. A girdle round the waist with a shark's tooth for a pendant strengthens the loins. Even animals wear protective necklets in the West Indies. In the market square of Gouyave, Grenada, I came across a very snappish dog who wore a collar made of alternating cashaw nuts and cork stopples to cure it of a cold. In Ireland, amulets are still tied to the horns or tails of cattle to preserve them from murrain and evil eye, and children wear necklaces made of the Virgin Mary's nut. The use of protective necklaces and girdles is world-wide in distribution, and its origin runs back to time immemorial. Probably both necklace and girdle arose from the Hindu japamala, or "muttering chaplet," and this, in turn, from knotted cords

and pebbles used for counting the repetition of prayers and charms. They were cherished tokens of motherly love, earnest appeals to the protection of the ever-present, all-seeing God, touching expressions of the ineffable yearning of the human heart.

Some of the remedies, such as urine in the treatment of eye diseases, may seem outrageous. but we should not forget that this waste-product of the human body has been widely used throughout the ages. Galen prescribed it in the second century of our era, Ambroise Paré in the sixteenth, and Madame de Sévigné, in one of her famous letters, written at the end of the seventeenth century, says: "*Pour mes vapeurs, je pris huit gouttes d'essence d'urine.*" Urine is used at the present day, both externally and internally, in most European countries. I have seen it quaffed in Lombardy with body lice steeped in it overnight to cure hæmatogenous jaundice. Even fæcal matter, the *emplastum aureum* of our forefathers, is still used to mature furuncles, carbuncles and other gatherings, or to ease the pain of articular rheumatism. And organotherapy is continued by the modern physician perhaps with as much empiricism as in the remote past, and often with no better judgment than was shown in the application of the extravagant signature theory.

Among the sick I came across was a poor young fellow who had returned from Colon, Panama, with a little money and a galloping tuberculosis; two boys with bloated, pale, wan faces, suffering from severe ankylostomiasis; a coy little maiden with a large keloid hanging like an ear-drop from the lobe of her left ear, the pedicle constricted in a horse-hair knot tied by the mother, who was out selling "belly soup" (tripe) at the time of my visit; and a very young woman presenting a small, flat, papular syphiloderm, to which the bystanders gave the name of "American plagues." The Barbadian name for syphilis is fully in accord with the old nomenclature of this disease, the origin of which, throughout the ages, has been racketed from one people to another. Until quite recently the Germans and Italians called it the French pox; the French, who invaded Italy under Charles VIII, named it the Neapolitan disease; the Spaniards ascribed it to the Jews, who themselves, long ages ago, placed it at the door of the Philistines. The ancient Romans incriminated the people of Capua and called it the Campanian disease.

(*To be continued.*)

Human Intestinal Protozoa in Amazonas (C. J Young, *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 1, March, 1922).—Five hundred persons living in Manaos were examined for intestinal protozoa with the results tabulated. The percentage of *Entamœba histolytica* cysts recorded was somewhat higher than those reported from other countries for which figures are available, excepting Malta.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JUNE 1, 1922.

Our next number (June 15) will be devoted specially to the late Sir Patrick Manson and his work. It will contain a short and most interesting Autobiography, several articles written in appreciation of his work by Experts, numerous original drawings from specimens prepared by Sir Patrick Manson, Dr. Low, Dr. Sambon, and others, two portraits, one a photograph of Sir Patrick in his laboratory, the other a full page reproduction of a drawing by Mr. A. J. E. Terzi, and a full Bibliography of Sir Patrick's publications. The price to non-subscribers will be 3s. net.

THE LIVERPOOL SCHOOL OF TROPICAL MEDICINE.

Historical Record.

The University Press of Liverpool, 1920, has issued a tidy volume of some 100 pages, giving an excellent account of this School since it was opened in 1898 to almost the present day.

The Frontispiece is a photograph of a wonderful man, being no other than Sir Alfred Lewis Jones, K.C.M.G., the founder and the great promoter and supporter of the School.

The Introduction claims, and rightly claims, that the School has gained a world-wide reputation, and in the pages of the "record" this fact is found to be increased even beyond what the public knew.

The second photograph we meet with is that of the late Sir Rubert Boyce, F.R.S., one "whose untiring enthusiasm for tropical medicine many of us can still recall." We would venture to bear yet a stronger testimony to the part that Sir Rubert took in this great work by saying, that not only many of us can still recall, but that neither the present generation nor generations to come will ever forget what he did in this great Imperial development.

As we read the various successes of initiation, the difficulties connected with the establishments of expeditions, the still greater difficulties of persuading the authorities at home, the scientific societies of the Empire of the importance of the movement and the business communities engaged in the overseas trade of the Empire, one fact stands out more prominently than any other, and that is the readiness with which medical men came forward at salaries amounting to a mere pittance to not only engage in research in most distant parts of the earth, but of a character attended with great risk to life. The death of man after man engaged in these expeditions and the narrow escapes with their lives of many others who suffered from them, in no way deter volunteers to fill the places of those who had fallen by the way, and for what? A sum which a labouring man would scorn and a trades' unionist would despise. A salary one quarter of the amount of the schoolmaster in the out-of-the-way Scottish parish of ——, whose salary amounts to £750 per annum and the sparse population of his parish but of a toy amount, a salary which a pupil teacher in a country school in Britain does not think it worth while to look at, and whose mental powers are often beneath that of her sisters engaged in service. The writer knows of a family of three girls brought up in a country village within thirty-five miles of London. Some twelve years ago he listened to the following conversation with their mother. On being asked what her daughters were doing she replied that Mary was doing well; she was head cook at a salary of £180 with Lady ——, mentioning one of the best known families in the county. On being asked what Jessie was doing, the reply was that she was second matron at a hotel in London, getting £150 a year and perquisites. "And what have you done with Lizzie?" "Oh, ye see, she was not so clever as the others, so we sent her to the teaching." Even she was getting a salary but little short of the brave men who had spent over £1,000 on their education, had reached, say, 25 years of age without earning a copper, and who were still engaged in training themselves for their life's work, and who, after they had reached that goal, had to be content with an income less than half the country parish schoolmaster was receiving in his rural retreat where expenses were infinitesimal and the amount of acquired knowledge necessary of but small amount. Our heroes of tropical medicine are no members of Carlyle's "Trades Unionist Society," which he styled "The Sluggards and Scoundrels Protection Society," which the writer has applied to our modern "trade unionists." The moneys they are to receive and their hours of labour are the last thing they ask about, and many a man has been well on his way across the ocean before he asks: "Oh, by the way, are we to receive any pay?" "Oh, but he is seeking reputation and kudos." The glory attaching to a cholera camp is far to seek; yet these heroes of the schools of tropical medicine went to regions where the diseases they were to encounter were unknown, for no man had as yet sounded the depths of their deadliness. They seek no bubble reputation even at the cannon's mouth, but unseen and to the Lord carry out the work set them to do with no V.C. to encourage them, nor anything but a beggarly pension, if even that much, to look forward to. In the tropics many examples of unpaid work for the benefit of the local population are a matter of history. There are numerous examples of schools and colleges of medicine in the British Empire being instituted and carried on for many years without the teachers receiving a cent in payment, and affording the expenses of the school out of their (the teachers) pockets. In the north of China several schools of medicine are in being, and in the south at Hong-Kong the teachers at the College of Medicine for many years taught daily without monetary reward of any kind. In several other British colonies a similar story is to hand, and even a home in rich London and Liverpool for the teaching of tropical medicine at the tropical schools the teachers were for many years unpaid when the schools were initiated and first opened.

There is no brighter story of devotion that can be unfolded when the history of the two great British schools of tropical medicine come to be set down in the light of bare facts, and the publication of the record of the Liverpool School is timely in its appearance. No claim is made by the recorders of this volume for the heroic and unpaid work of the men they mention in these pages. The deaths of young and promising men sacrificed to science and the Empire are stated merely, and a memorial tablet or two are set forth. To Sir Rubert Boyce a memorial tablet states: "In memory of one who served here with an ardour and an energy

that knew neither ebb nor repose, but the University he helped to establish, and the School of Tropical Medicine which under his leadership has increased health and lessened suffering in the remotest regions of the world are his true and lasting monument."

Another tablet, the Walter Myers memorial tablet, reads as follows:—

"On this tablet the Liverpool School of Tropical Medicine commemorates the untimely loss in his 29th year of Walter Myers, who on a mission of the School amid his researches to overcome the malady died of yellow fever on January 20, 1901. From the service of truth and humanity upon earth in the morning of his manhood he passed to God." In pursuance of the Walter Myers memorial a lectureship named the Walter Myers Lectureship was established in 1903, of which the first occupant was no other than Major Ross himself, whose name in connection with the Liverpool School was to become famous and familiar and synonymous with the very existence of the School itself. Another irreparable loss to the School and to science was sustained by the death of Dr. J. Everett Dutton whilst actively engaged on the Congo, along with Dr. J. L. Todd, in the investigation of trypanosomiasis and tick fever. Towards the end of 1904 they had reached Stanley Falls, and independently they were able to demonstrate the cause of tick fever in man, a discovery made a few weeks previously by Ross and Milne in the Uganda Protectorate. Further, they were able to prove the transference of the disease from man to monkeys by means of a particular species of tick. During these investigations both observers contracted the disease. The last letter from Dr. Dutton was dated February 9, 1905, in excellent spirits, yet on the 27th of the same month he was dead of the very disease he was investigating. A permanent testimonial in the shape of a Dutton Memorial Chair of Tropical Entomology was established in 1910.

The activity of the Liverpool School of Tropical Medicine has since its early days been characterized by scientific expeditions of investigation. In all thirty-two special expeditions between the years 1899 and 1913 were sent out; to give detailed accounts of each would be but to reprint the "Historical Record" of what has been so well done by the authors of the work published by the Liverpool University Press. This would be an ungracious act, although we should with the greatest pleasure do so if for no other reason than to give world testimony to the high appreciation in which we hold the names of the famous men who have been associated with it.

Of these no fewer than ten expeditions were concerned with malaria. The first was despatched to Sierra Leone in July, 1899, and the names of the men are worthy of being widely known. Naturally, it was led by Major Ronald Ross, C.B., F.R.S., the pioneer of practical malaria studies. He was accompanied by Dr. H. E. Annett, Mr. E. E. Austen (of the British Museum), and Dr. Van Neck (of Belgium). Four expeditions dealt with yellow fever, and sanitation expeditions, the first initiated in 1901 by Sir Ronald Ross, numbered six in all. Trypanosomiasis occupied the attention of those engaged in the sixth and tenth expeditions, and sleeping sickness those engaged in the eighteenth and twenty-seventh. In fact, there are few diseases specially designated "tropical" which were not dealt with by the men engaged in these great expeditions to diseased areas in the tropics and sub-tropics, including Greece, Khartoum, West Indies, &c.

We long to mention the names of all the men who went on these expeditions. A few are here appended in order of their going: Sir Ronald Ross, K.C.B., F.R.S.; Dr. Annett; Mr. E. E. Austen; Dr. Van Neck; J. E. Dutton and —. Elliott; H. E. Durham; Walter Myers; Logan Taylor; C. Balfour Stewart; Sir Wm. MacGregor, K.C.M.G. (Governor of Lagos); J. L. Todd; C. Christy; Professor Walter Boyce, F.R.S.; Arthur Evans; Herbert C. Clarke; Lt.-Col. G. M. Giles; Arthur Evans; R. E. M'Connell; H. Wolferstan Thomas; Anton Breinl; Allan Kinghorn; R. E. Montgomery, M.R.C.V.S.; J. O. Wakelin; W. Yorke; R. Newstead; W. T. Prout, C.M.G.; Alan Hanley; J. W. W. Stephens; S. B. Wolbach; Harald Seidelin; D. Thomson; H. B. Fantham; B Blacklock.

Major Sir Ronald Ross, K.C.B., F.R.S., it will be remembered, was the recipient of the Nobel prize, a reward for his life's work in accordance with the high position he holds amongst the great scientists of the world. One is tempted to dwell upon Sir Ronald Ross and his great career, but in 1917 he left Liverpool and the School of Tropical Medicine to take up his abode in London. One name of many laymen we cannot allow to go unmentioned in these sketchy notes. The late Sir Alfred Lewis Jones, K.C.M.G., has been the founder of this great School, the supporter of it financially in many difficulties, and in his will he allocated enormous sums of money to perpetuate the School, to be known under such branches as "The Sir Alfred Lewis Jones Bequest," "The Sir Alfred Lewis Jones Tropical Ward," "The Alfred Jones Chair of Tropical Medicine," and for other scientific and clinical purposes. Dr. J. W. W. Stephens, M.D., F.R.S., since 1913 has occupied the Chair of Tropical Medicine founded by the late Sir Alfred Jones.

An important addition to the Committee of the Tropical School is the Vice-Chancellor of the Liverpool University, J. G. Adami, F.R.S.

The initials of the editors of the Record are appended at the end of the text. They are:—

J. W. W. S.
W. Y.
B. B.

We would wish to congratulate them on a piece of work well conceived and well done.

J. Cantlie.

P.S.—We thank the editors for settling a mute point in connection with the Schools of London and

Liverpool. In a footnote on pages 4 and 5 we read that the Liverpool School officially opened on April 22, 1899, and the London School on October 3, 1899.

Annotations.

The Inter-relationships between the various Members of the B. enteritidis—B. paratyphosus B Group of Bacteria (W. W. C. Topley, M.A., M.D., F.R.C.P.; H. B. Weir, M.A., M.B., B.C.; and G. S. Wilson, M.D., M.R.C.P., D.P.H., *Journal of Hygiene*, vol. xx, No. 3, November, 1921).—The authors have come to the conclusion that it is probable that the relation between *Bacillus enteritidis* (Gaertner) and many of the members of the *B. paratyphosus* B group of bacteria is similar to that existing between the serological subgroups of such bacterial species as the meningococcus or the pneumococcus. It is therefore suggested that, for purposes of classification and nomenclature, *B. enteritidis* should be included in this group, and that its name might well be applied to the whole group of which it forms a part, both on account of priority and of suitability. The subgroup, or variety, to which a given strain belongs, provided that this is sufficiently definite and constant, should be indicated by adding a name designating the subgroup or variety in question.

Myeosis Fungoides in a Moroccan (Decrop and Salle, *Bull. Soc. française de Dermat. et Syph.*, No. 4, 1921).—The patient was a native of about 50 years of age; a characteristic erythematous rash was observed, followed by tumours and general infiltration of the skin, the irritation being intense. Blood counts were taken and showed normal leucocytic formula with a large number of transitional forms. Treatment consisted of injections of N.A.B.

The Heart in Beriberi and the Evidence of the Differential Stethoscope (C. A. Sprawson, *Indian Journal of Medical Research*, vol. ix, No. 3, January, 1922).—About half the number of Chinese beriberi cases showed on admission some cardiac abnormality, which was usually slight enough to disappear shortly after treatment by rest in bed.

There was distinct evidence of myocardial debility, as shown by the differential stethoscope in beriberi cases. Both sides of the heart may be affected, the right usually somewhat more than the left.

The use of the differential stethoscope was sometimes of aid in prognosis and treatment.

Phagocytosis of Amœbæ and Ciliates compared with Phagocytosis of Leucocytes (R. Oehler, *Mediz. Klinik*, vol. xvii, No. 16, April, 1921).—The author is of the opinion that there is a great deal of difference between metazoan phagocytosis and the mechanism of nutrition in bacteria-eating protozoa. Bacteria are not a necessary element of food in the nutrition of phagocytes; they live by osmosis alone; this is not the case with bacteria-eating protozoa, as in their case bacteria are absolutely necessary. They are easily digested and got rid of by the protozoa, but can be taken still alive from phagocytes.

Betelnut Chewing and its Effects, including Cancer of the Mouth (Aller G. Ellis, M.D., *Archives of Internal Medicine*, vol. xxviii, September, 1921). —The author comes to the following conclusions:—

Betelnut chewing prevents decay of the teeth almost completely, apparently by the deposit of concretions. Neither antiseptic nor bactericidal action on the flora of the mouth is exerted by the substances chewed. Direct constitutional effects of the habit appear to be negligible.

Betelnut chewing leads to chronic changes in the mucous membrane of the mouth, recession of the gums, pyorrhœa alveolaris, deposit of lime concretions of the teeth, atrophy of alveolar process, and loosening and loss of teeth. The exact way or ways in which teeth are loosened is not well understood. As the loss of teeth appears to be the most serious result of betelnut chewing, a thorough study of its mechanism and prevention is eminently desirable.

Betelnut chewing does not infrequently cause cancer of the mouth, but there are reasons for believing that, in an as yet undetermined percentage of cases, it does lead to this result.

The Relation of the Domestic Chicken to the Spread of Hookworm Disease (James E. Ackert, Ph.D., *American Journal of Hygiene*, vol. ii, No. 1, January, 1922).—The length of time required for food material to pass through the digestive tract of chickens ranges from two hours and forty minutes to sixteen or more hours. Hookworm eggs remain viable while passing through the alimentary canal of chickens and are able to hatch. Hookworm eggs swallowed by chickens produce infective hookworm larvæ when the fowl fæces are mixed with animal charcoal or with soil.

The results of a series of experimental feedings indicate that the great majority of hookworm eggs ingested by chickens fail to produce infective hookworm larvæ. This failure is attributed in part to breaking of eggs in the gizzard, injury from urine in the fæces, and to malnutrition of the larvæ in the excrement.

Dangerous infective spots may be established around drinking receptacles by chickens that have swallowed hookworm eggs day after day. Hookworm eggs deposited out of doors under conditions unfavourable for development can be carried by chickens to favourable environments. Human stools voided in unfrequented places can be transported

by chickens to the door yard which is traversed by bare-footed persons.

Newly hatched hookworm larvæ can pass through the digestive tracts of chickens apparently uninjured. Sheathed hookworm larvæ swallowed by chickens fail to pass at once through the fowls unaltered. *Strongyloides stercoralis* larvæ occurring in the human stools passed through the chickens and soon attained the infective stage, a single mature male of the free-living generation having been seen.

The various experiments first performed on adult chickens were later repeated with young ones with similar results in each case. A comparison of the reduction of mature hookworm larvæ by fowls with the establishment of infective spots by them convinces the writer that chickens are more beneficial than harmful in the control of hookworm disease in Trinidad.

An Epidemiological Study of Hookworm Disease in a Cacao Estate (W. W. Cort, Ph.D., and G. C. Payne, M.D., *American Journal of Hygiene*, vol. ii, No. 2, March, 1922).—Examination of the people living in three houses on a cacao estate showed a heavy infestation with hookworms. Soil pollution in this area was almost entirely restricted to definite spots—"natural latrines" in the cacao grove near the barracks.

The examination of soil samples showed very little soil infestation anywhere in the area, except at the "natural latrines" in the cacao, and the conclusion can be drawn that almost all the human infestation must have come from the habit of polluting the soil of the cacao. Even in the "natural latrines" the findings were somewhat irregular, indicating the conditions were not always favourable for the development of hookworm larvæ, and that they did not migrate from the place of development.

Examination of the soil of the intensely polluted spots in the cacao, six weeks after three routine treatments had been given to the people, showed a very marked reduction of soil infestation, indicating that in this situation the life of the infective hookworm larvæ is short.

Circulatory Compensation for Deficient Oxygen-carrying Capacity of the Blood in Severe Anæmias (George Fahr and Ethel Ronzone, *Archives of Internal Medicine*, vol. xxix, No. 3, March, 1922).—In severe anæmias increased minute volume is the outstanding compensatory mechanism for the loss of oxygen-carrying power of the blood. In a case of severe pernicious anæmia the minute volume was increased about 250 per cent. and the systolic output in the same degree. The increased blood velocity was very largely due to lowered blood viscosity, this being lowered to 45 per cent. of its normal value. Another factor was increased effective cross section of the vascular tubing.

Microscopic examination of the skin capillaries showed that they were contracted down to half the normal diameter or less, thus determining a lessened blood flow through the skin and a larger flow through the other organs. The lessened quantity of blood in the skin is certainly one factor in the degree of the paling of the skin.

The coronary circulation is at the upper limit of the possible, being about as large as that found in very severe work. There is a very great possibility that when a patient with severe anæmia tries to work anoxemia of the heart muscle is produced. The pathologic changes in the heart muscle in pernicious anæmia may well be due to lack of oxygen.

Suggestions for a Broader Application of Cambusia for the Purpose of Mosquito Control in the South (S. F. Hildebrand, *Public Health Reports*, Washington, June, 1921).—The author urges the distribution of the fish, *Cambusia*, to all standing and sluggish waters as far as possible, as its value in mosquito control is well known. Ponds that are adapted to the propagation of fish should be used to breed them for distribution in other parts.

Treatment of Ringworm of the Scalp by Röntgen Rays (Howard Fox, M.D., and T. B. H. Anderson, M.D., *Journal of the American Medical Association*, vol. lxxvii, No. 17, October, 1921).—The authors are of the opinion that from both a theoretical and a practical standpoint the best treatment for ringworm of the scalp is by means of the Röntgen rays. The method is quite easy to learn with the present knowledge of exact measured dosage and without the use of pastilles. With reasonable care it is safe, rapid and efficient.

Some Public Health Problems of the Far East (R. W. Mendelson, M.D., *Journal of the American Medical Association*, vol lxxvii, No. 17, October, 1921).—In the absence of virtually all knowledge of the laws of hygiene, personal and public, it is a wonder, in the author's opinion, that the population of Siam are alive at all. The fact that they are, and that they seemingly thrive, the death-rate being consistently lower than the birth-rate in face of the enormous mortality, is proof in itself of the great natural resistance the people possess. Education, though slow, is the only sure way of producing permanent results. Force is productive only of hostility. The health officer should practise a wise conservatism. Radical preventive methods cannot be applied, and the sooner the health officer appreciates this fact, the less disappointing will his results be.

Epidermophytosis (C. J. White, M.D., and A. M. Greenwood, M.D., *Journal of the American Medical Association*, vol. lxxvii, No. 17, October, 1921).—The authors do not question epidermophytosis as a

distinct dermatologic entity from the mycological point of view, but from the clinical appearance they are not able at present to predict in a given case what genus of fungi will be found by cultural examination. According to experience, at least 50 per cent. of such cases are due to trichophytons, including the groin and intertriginous cases ordinarily considered always due to *Epidermophyton cruris*. It may well be that future work will make it possible to differentiate clinically between epidermophytosis and the dermatoses caused by other genera.

Review of the position of the Genus Hæmocystidium (Castellani and Willey, 1904), *with a Description of Two New Species* (Capt. H. E. Shortt, I.M.S., *Indian Journal of Medical Research*, vol. ix, No. 4, April, 1922).—According to the author, this genus should be included in the genus *Hæmoproteus*.

On the Immunizing Properties of Allied Organisms and Non-specific Organisms (Lt.-Col. W. F. Harvey, M.A., and Capt. K. R. Iyengar, *Indian Journal of Medical Research*, vol. ix, No. 4, April, 1922).—In experimenting with pigeons and with *Bacillus avisepticus*, the author came to the following conclusions: The prophylactic use of the specific organism showed a great saving of life (fifteen animals out of fifteen) as compared with a control series in which there was great mortality.

The prophylactic inoculation of an allied organism, *B. cuniculisepticus*, showed no evidence of any greater saving of life than did the prophylactic inoculation of a wholly non-specific organism.

Distinct evidence of protection by the prophylactic inoculation of a non-specific organism has been demonstrated.

Virulence of the Organism as a Factor in the Efficacy of Prophylactic Vaccines (Lt.-Col. W. F. Harvey, M.A., and Capt. K. R. Iyengar, *Indian Journal of Medical Research*, vol. ix, No. 4, April, 1922).—The conclusions in regard to the bacillus of fowl cholera, and with reference to methods used in trials, are as follows:—

(1) Protection afforded by prophylactic administration of an avirulent organism to infection by the organism in its virulent condition.

(2) The protection afforded by the avirulent strain bears the proportion in these trials to that afforded by the virulent strain of nine lives saved out of fifteen, as against ten lives out of fifteen. The difference shown between the two is only slight, and may or may not be really in favour of the use of the virulent strain.

(3) The response to inoculation of an avirulent strain in the shape of agglutinating power of the serum is the same broth for the avirulent and the virulent strain. The same result holds good for the inoculation of a virulent strain.

Relapsing Fever in the Punjab (Brevet Lt.-Col. C. A. Gill, I.M.S., D.P.H., D.T.M. & H., *Indian Journal of Medical Research*, vol. ix, No. 4, April, 1922).—It is clear that relapsing fever must now be regarded as a disease which is widely endemic in the Punjab, and which at more or less regular intervals is apt to assume epidemic proportions. This fact, it is thought, requires more explicit recognition than it has hitherto received.

Owing to the absence of dramatic clinical features in relapsing fever and, it is believed, the not infrequent occurrence of mild and atypical cases, the diagnosis of the disease is apt to present great difficulties.

It is therefore necessary that the possibility of relapsing fever should be borne in mind in all obscure cases of "fever," and that steps should be taken to verify the presence of relapsing fever by means of the examination of blood films.

In connection with the clinical aspect of the disease, it is desired to emphasize the peculiar liability of relapsing fever to be confused with lobar pneumonia and influenza. So much is this the case that it is a reasonable assumption that all localized epidemics of these diseases, as well as "pleuro-pneumonia" and "septic-pneumonia" occurring in the Punjab in the months of May and June, should be regarded, until the contrary be proved, as possibly due to relapsing fever.

It is possible, by means of the examination of blood films, to verify at once the presence or absence of relapsing fever, and in no disease is this method of diagnosis of more importance, since by a single injection of salvarsan or one of its substitutes a prompt and certain cure can usually be obtained.

The prevention of the disease is of even more importance than its cure, but this matter, in the case of the civil population of the Punjab, is beset with great difficulties. It must be presumed that the disease is spread in the Punjab, as elsewhere in India, by the body-louse, and that these parasites are universally prevalent more especially in rural districts. To "de-louse" a civil population of about 20 million people is obviously an impossible task, but in certain areas and under certain conditions some action along these lines is not impossible. Thus in the case of troops, of the police, and of prisoners in jails, amongst whom some echo of the present epidemic of relapsing fever in the Punjab must be anticipated to occur, no insuperable difficulties need arise in carrying out this measure.

The Cultivation and Biological Characteristics of Spirochæta obermeieri (Recurrentis) (I. Kligler, Ph.D., and O. Robertson, M.D., *Journal of Experimental Medicine*, vol. xxxv, No. 3, March, 1922).—A study of the growth requirements of *Spirochæta obermeieri* resulted in the perfection of a method which enabled the authors to cultivate the organisms consistently from the blood of infected mice and rats, to maintain the viability

of cultures for periods of at least three to seven weeks, and to carry them on in successive subcultures by transplanting at intervals of two to four weeks. This method is essentially the same as the Noguchi technique for the cultivation of the *Leptospira* group, but emphasizes control of the physico-chemical factors that act to limit and prevent growth and prescribes the conditions necessary to counteract the injurious influences. The main facts may be briefly summarized as follows:—

(*a*) Ascitic fluid, horse or rabbit serum may be used as culture fluids.

(*b*) These fluids become progressively more alkaline on exposure to air.

(*c*) Uniformly successful results depend chiefly on the proper adjustment and stabilization of the reaction.

(*d*) A balanced reaction can be secured by adding 1·0 per cent. peptone broth or egg albumin as buffer, and covering the culture with a layer of oil.

(*e*) The reaction limits for growth and survival are between pH. 6·8 and 8·2, with the optimum at pH. 7·2 to 7·4.

(*f*) *Spirochæta obermeieri* is a strict aerobe, consequently, in order to permit adequate aeration, the oil layer should not exceed 1·5 cm. in height.

The Results of Hookworm Disease Prophylaxis in Brazil (Wilson G. Smillie, M.D., *American Journal of Hygiene*, vol. ii, No. 1, January, 1922).—A resurvey of Ilha do Governador after four years of hookworm disease prophylaxis shows that hookworm disease, as a disease, has disappeared from the island. The infection index, as demonstrated by microscopic examination of the stools, has scarcely diminished at all during the period. The two effective factors in this prophylaxis have been the intensive treatment campaign and the installation of latrines.

The individuals who took treatment, yet who had not installed latrines or who had used them only part of the time, harbour a much smaller number of hookworms than the control cases, manifesting that the benefits of the treatment alone are maintained for a period of more than three years.

Hæmolysis of Erythrocytes in Contact with Glass (Waldace O. Fenn, Ph.D., *Journal of Experimental Medicine*, vol. xxxv, No. 2, February, 1922).—Washed erythrocytes, in both acid and alkaline solutions, hæmolyse more rapidly when allowed to settle out on a clean microscope slide than when kept in suspension. This is also true on slides coated with paraffin, paraffin oil, or vaseline, and on mica surfaces. The presence of as little as 0·1 per cent. serum inhibits such contact hæmolysis, particularly in alkaline solutions.

Contact hæmolysis is most marked on slightly soiled glass, and may occur so rapidly with unfixed cells in a hæmocytometer that accurate counts are rendered impossible. Erythrocytes are more sticky than normally in acid solutions and less sticky in alkaline solutions.

The increased stickiness of erythrocytes in acid solutions and their larger size during contact hæmolysis in acid media provide some experimental evidence of the view that contact hæmolysis is to be correlated with an attempt on the part of the corpuscles, or some ingredient of the corpuscles, to spread on the glass after the manner of leucocytes and invertebrate blood cells.

The Erythropoietic Action of Germanium Dioxide (F. A. Hammett, Ph.D., J. E. Nowrey, Junr., and J. H. Müller, Ph.D., *Journal of Experimental Medicine*, vol. xxxv, No. 2, February, 1922).—Injections were made of a sterile 0·4 per cent. solution of germanium dioxide into four lots of mature male and female albino rats. Exact conditions of control were maintained. There was an apparent tendency for the degree of effect to be related to the initial erythocyte number, in that with a lower initial count there seemed to take place a greater rise, and vice versa.

There was no indication that the larger doses of germanium dioxide exerted a greater stimulating effect on the production of the resultant erythrocythemia than the smaller doses.

There is evidence that the effect is quick in making its appearance. The rise in the red cell count was found to occur within a week, and after but two injections of the oxide. Indications were obtained that germanium dioxide tends to increase the coagulability of the blood. Autopsy findings showed colour changes in the liver and bone marrow.

It is believed that germanium dioxide is an erythrocytogenic agent, and it is hoped that fruitful results will come from its therapeutic application.

Rats and Mice Destruction Act (G. L. Moore, *Journal of the Royal Sanitary Institute*, May, 1921).—Poisoning through safe media is one of the best means of destroying rats and mice, but sufficient emphasis must be laid on the fact that no amount of poisoning will serve to clear a district unless ratproofing measures are taken immediately following a clearance, which will prove only temporary unless preventive measures are taken for the protection of premises and the food supply.

Preliminary Note on the Development of the Leishman-Donovan Parasite in Spleen Juice and in the Alimentary Tract of Cimex lectularius (Lin.) Helen A. Adie, *Journal of Indian Medical Research*, vol. ix, No. 2, October, 1921).—From observations made, it appears that the vegetative intracellular and propagative phases of Leishman-Donovan parasites react to stimuli and environment.

(1) Rheo-taxis effects brought about by the nutriment absorbed by the parasite; (2) thermo-

taxis for selection of suitable host cells, and later sexual attraction. The stimuli are inter-dependent. It has been observed that if the temperature, favourable to the highest pitch of vital activity, is exceeded, the Leishman-Donovan parasite dies. Perhaps this may explain why kala-azar flourishes in Assam, Madras, the Mediterranean, and other regions, where the optimum temperature is not exceeded for prolonged periods.

Abstracts and Reprints.

IMMUNIZATION OR RESPONSE OF IMMUNIZED ANIMALS TO A SMALL DOSE OF ANTIGEN ADMINISTERED AT A LONG INTERVAL AFTER FIRST IMMUNIZATION.[1]

By Lieutenant-Colonel W. F. Harvey, M.A.

The points which were elucidated by this investigation were:—

(1) Whether an animal once immunized remained an animal always differentiated from one which had not been immunized?

(2) Whether an animal once immunized was more responsive to the introduction or application of antigen than one which had not been so immunized?

With the help of some latitude in termiuology the expression immunized animal here may be taken to cover the cases of the individual or animal which has once been prophylactically inoculated, and the individual or animal which remains an active carrier after having once suffered the disease. The number of animals used in the experiments given are much too few to admit of any categorical answer to the questions. Moreover, the only trial made was of an intravenous inoculation of the minimal doses designed to elicit a large response. Nevertheless, it is reasonable to suppose that, with sufficient delicacy of the test applied, cutaneous, intracutaneous, subcutaneous, intraperitoneal, subdural, or other mode of introduction or application of antigen might be proproductive of similar effects. The practical applications of the thesis propounded here would be that direct evidence of the immunized state or, as the case may be, the sensitized state, should be found in all cases by direct investigation or serum reactions or by investigation of these reactions after introduction or application of a suitable and minimal dose of antigen. A little further extension of the idea contained in the thesis might lead us to suppose that quite a minimal dose of antigen would be sufficient to immunize an individual after he had once been immunized. If such be the case this would have far-reaching effects on the practice of prophylactic vaccination. Instead of the repetition of the same large doses of prophylactic vaccine periodically, all that would be required after the first immunizing inoculation would be repetition of quite minimal doses, with saving of quantities manufactured and saving of unpleasant reaction.

[1] Abstracted from the *Indian Journal of Medical Research*, vol ix, No. 4, April, 1922.

Conclusions.

The conclusious giveu are to be differentiated from the "discussion" given above as they are based strictly on the experimentation recorded.

(1) The agglutination effect of intravenous inoculation of typhoid antigen in pigeons shows a diminution month by month after the inoculation. The drop is marked between the tenth and twentieth day, and seems to reach a constant low level, which is, however, higher than that of the uninoculated animal.

(2) The introduction intravenously of a dose of antigen one-tenth to one-twentieth smaller than the original dose, and even smaller than that, calls forth an agglutinin response in the twelve months' previously inoculated pigeons, which is significantly greater than that elicited in uninoculated pigeons receiving the same doses.

Medical News.

KALA-AZAR INQUIRY OF THE INDIAN RESEARCH FUND ASSOCIATION.

In the January, 1922, number of the *Indian Journal of Medical Research* a telegram from Mrs. Adie was published, in which she stated that she had found Leishman-Donovan bodies in the salivary glands and ducts of *Cimex rotundatus*, caught on the bed of a suspected case of kala-azar in an infected area. Mrs. Adie's specimens were sent to Lt.-Col. Christophers, C.I.E., I.M.S., of the Central Research Institute, Kasauli, for examination, and he has submitted a note on the bodies found by Mrs. Adie in the salivary glands of *C. rotundatus*. Lt.-Col. Christophers considers that these bodies are a species of Nosema which, if new, would be called *N. adiei*.

Correspondence.

To the Editor of The Journal of Tropical Medicine and Hygiene.

"A Choleroid Epidemic in the United Provinces" (Journal of Tropical Medicine and Hygiene, March 1, 1922). Col. C. A. Sprawson, in a letter to the Editors, wishes to emphasize the point that last year there was in the United Provinces a very extensive epidemic of a disease clinically indistinguishable from cholera so far as individual cases were concerned; but that this disease

was not due to the cholera vibrio, but apparently to the paratypoid B bacillus. Similar phenomena due to paratyphoid B have been previously reported, but not in such an extensive epidemic form.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—The issue of your Journal of March 1, 1922, contains an important article by Geraldine Z. L. LeBas, B.Sc.Lond., regarding the nature of the antigen employed in the complement-fixation test for bilharziosis. Evidence is presented showing that this antigen, while being insoluble in absolute alcohol and acetone, is soluble in saline, and in alcohol diluted with saline (50 per cent.). LeBas rightly points out that the original antigen I used, though extracted with absolute alcohol, contained an undetermined proportion of watery content. This extract, however, at a minimum could not have represented less than an 85 per cent. alcoholic extract of cercarial and liver tissue.

When in 1919 I reported a specific complement-fixation reaction for bilharziosis certain authorities were diffident about accepting the reaction on a specific immunological basis, owing to the alcohol soluble properties of the antigen employed. This opinion was expressed partially because alcoholic extracts did not generally constitute efficient antigens in bacterial infections, and partly because the biochemical constitution of antigens was believed to consist of protein which was not alcohol soluble. Granting the protein nature of antigen, however, the criticism was hardly valid, for the chemistry of helminthic protein has been little studied, while a group of proteins—the Prolamines —were known to be soluble in 50 to 85 per cent. of alcohol. Furthermore, the lipo-proteins had been shown by Landsteiner to go into solution or fine emulsion in organic solvents, and the same observer demonstrated that lipoids possess the peculiar property of altering the solubility of proteins by their mere presence in solution. Biochemists of to-day appear to be less sure of the protein basis of antigen than they were a decade ago. It has been found that the greater the state of purity of the antigen the less marked do the characteristic tests for protein become. Warden has recently produced evidence favouring the view that the specific antigens of cells, bacterial or somatic, consist of various fat complexes which bestow upon their particulate surface definite chemical character.

Criticism in scientific inquiry is frequently beneficial; here it was useful inasmuch as it had the effect of stimulating further observation on this subject. During the past two years I have had the opportunity in Australia of making detailed serological studies on echinococcal infestations of man and liver fluke (*Fasciola hepatica*) in sheep. With the object of working out the site of production of hydatid antigen scolices, which were collected in large quantities from the cysts of sheep, were centrifugalized and washed with normal saline solution. The saline was pipetted off, the scolex sediment collected, mixed with sand and triturated. Absolute alcohol was added as the solvent. Investigation proved that this extract constituted a highly potent and specific antigen, whereas similar extracts from the walls of mother and daughter cysts possessed no specific antigenic properties whatever. Later, when investigating the complement-fixation reaction in distomiasis fresh flukes (*F. hepatica*) were obtained from the biliary passages, and after washing in saline were dried between filter papers. Subsequently the parasites were ground up with sand and extracted with absolute alcohol. A highly specific and potent antigen was again manufactured. Apart from these instances the literature contains examples of the alcohol soluble property of helminthic antigen, and any theory regarding the nature and mode of action of antigen in immunity processes must take cognizance of these irrefutably established facts.

The scope and value of serological diagnosis in helminthiasis has not yet received that detailed consideration which is its due. Much valuable information regarding helminthic antigen in particular, and indeed the nature of antigens in general, might be obtained as the result of the co-ordinated efforts of the biochemist and serologist directed along these lines. The helminthic diseases afford special scope for serological investigation, as frequently the parasites are bulky enough to allow manufacture of antigenic extracts, and in certain infestations the antigen is already available in a very pure condition (viz., hydatid fluid). Different observers have reported the existence of antibody in the blood of patients infested with *Ankylostoma duodenale* and various other intestinal parasites, as well as those in which invasion of the internal organs occurs, as in echinococcosis, bilharziosis, paragonimiasis and hepatic distomiasis (*F. hepatica*).

Systematic investigation on this subject during the last six years has convinced me of the great value of the Bordet-Gengou complement-fixation reaction in helminthic diseases, not only from the standpoint of increasing the efficiency of clinical diagnosis, but also by affording an additional index to the effect of treatment by parasiticidal drugs.

The remarkably fine investigations on gonorrhœa and syphilis, undertaken under the direction of the Medical Research Council, illustrate what can be done in the direction of improving technique and assessing the value of serological diagnosis in disease. The suggestion is made to research workers in tropical climates and to those who direct the policy of research in tropical medicine that the time is ripe for a similar consideration of the serological problems of helminthic diseases.

I am, Sir, yours faithfully,

N. HAMILTON FAIRLEY,
Tata Professor of Clinical Medicine.
April 27, 1922. *Parel, Bombay.*

IN COMMEMORATION

OF

THE LIFE AND WORK

OF THE LATE

SIR PATRICK MANSON, G.C.M.G., F.R.S., LL.D.

For several recent issues of the Journal I have published in the form of leading articles personal remarks on my knowledge of Sir Patrick Manson gathered from intimate association with him whilst he was in practice in Hong-Kong and for the past twenty-five years in London. In this issue more valuable and important testimony has been gathered by Dr. Louis Sambon, who was more intimately acquainted with Sir Patrick in his literary and scientific work.

To Dr. Sambon, moreover, he dictated an account of the evolution of his life's work from its beginning to its completion. It is a marvellous story, and to those who believe in divine guidance, a confirmation of such mysteries. As a scientist, as a physician, and as an organizer, there are few of the great men of the world whose record is more glorious and interesting. In my humble way I can still add yet another phase of his life, namely, that of a surgeon. I knew Sir Patrick as a surgeon, and although he publicly stated that he was an indifferent surgeon, my testimony does not bear out that deprecatory opinion of himself. His originality in the matter of the operation for liver abscess was sufficient to stamp Sir Patrick as a capable surgeon, original in conception, precise in execution, versed in the methods of Lister and acquainted with the details thereof. I adopted Manson's teaching, and can vouch for its excellence, more especially after operating on well-nigh 200 cases. I also adopted his teaching in removal of elephantoid scrotum which gave highly successful results.

As a lithotomist Manson had a great name and great experience. He practised the perineal operation, and by a centrally grooved staff. The writer followed his example, refusing all his life to follow the suprapubic path for either bladder-calculi, or prostate removal in common with the more modern surgeons of many countries.

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In this issue we find special articles by several distinguished men concerning Manson's work. Mr. H. A. Baylis, M.A., D.Sc., of the Natural History Department of the British Museum, contributes a most illuminating paper on "Manson's Part in Helminthological Discovery." Dr. Baylis, in the spirit of the true scientist, judges the rights and the wrongs of Manson's work. He has confined himself to plain statements of fact, and has avoided any semblance of partisanship on controversial points arising on several of Sir Patrick's discoveries. *Paragonimus westermanii* was one of these. *Sparganum mansoni* was another. *Schistosoma mansoni* came to be dealt with by many observers, and brought to light much that was obscure on the subject.

The Filariidæ were dealt with by Manson fully and scientifically. He described several new species, studied their bionomics, their mode of transmission, and the morbid changes they may give rise to.

Yet another interesting nematode which infests the eyes of fowls and allied birds was first noticed by Manson, and *Oryspirura mansoni*, which Cobbold described and named in 1879, has excited some interest.

Mr. Edwards of the Natural History Museum offers, as a tribute to Manson, a very useful list of the mosquitoes known to be, or suspected to be, carriers of *Filaria bancrofti*.

Sir Frederick Mott, F.R.S., gives an account of the part played by Manson in the elucidation of sleeping sickness; and tells how he helped him in bringing about an inquiry on asylum dysentery.

Professor R. Tanner Hewlett, M.D., F.R.C.P., Director, Bacteriological Department, King's College, London, and Lecturer on Bacteriology, London School of Tropical Medicine, London, during a close association with Manson for over a quarter of a century, pays a warm tribute to Manson as a bacteriologist, and to his originality in this and in all branches of clinical and scientific work appertaining to tropical medicine in all its phases.

Dr. J. M. H. MacLeod, M.D., F.R.C.P., Lecturer on Dermatology, London School of Tropical Medicine, and author of "Skin Diseases of the Tropics," contributes an appreciation of Manson as a dermatologist, and assigns him a high place in that special branch of medicine, and claims him to be one, if not the first, to take up the scientific study of skin ailments in the tropics and to stimulate others to deal with the subject.

Dr. Louis Westenra Sambon, M.D., F.Z.S., Lecturer to the London School of Tropical Medicine, publishes a tribute to Manson's memory, a pæan of praise in his honour, and heartfelt sorrow at the loss to himself and to the world of one whose work and example has had no superior. He further contributes a synopsis of the Family *Linguatulidæ*.

He has thoroughly investigated this curious and difficult group of parasitic animals, the systematic position of which has been a puzzle to zoologists from the fourteenth century to the present day. Sambon shows that they should be regarded as degraded Acarina and divides the family into two subfamilies and eleven genera. Hitherto we had a single family of unknown extraction consisting of only two genera, *Linguatula* and *Porocephalus*. It is true that Professor H. Ward of Illinois had suggested a third genus *Reighardia* in 1918, but his diagnosis of this genus rested on a single character: the absence of annulation, and that was wrong, because *Reighardia* is annulated like all other linguatulids, though the annulation may be obliterated in fully distended female specimens. Far more interesting are the true generic characters of *Reighardia:* a six-legged larva, and a sacciform utero-vagina opening at the anterior end of the abdomen instead of the long, much coiled tubular organ of all other linguatulids, save *Raillietiella*, oponing at the posterior end of the body.

Sambon's classification is illustrated by beautiful, clear, convincing outline drawings of the various genera and species.

Dr. G. Giglioli discusses sunstroke, and shows that by taking up Sambon's views on the subject, Sir Patrick gave evidence of his foresight. Many of the cases once labelled "sun-stroke," "heat apoplexy," and "thermic fever" now are known to be cases of parasitism, as Sambon suggested in his well-known paper on Acclimatizatiou; they are cases of comatose pernicious malaria. This, the recent Great War has proved beyond doubt.

Mr. S. Honeyman, Librarian to the British Medical Association, supplies us with a most complete and interesting Bibliography of the writings of the late Sir Patrick Manson, G.C.M.G., LL.D., F.R.S., 1878-1919. Mr. Honeyman has given us a chronological report, for which we are all thankful, and wo extend to him our admiration and thanks for labour of love in the matter.

Last, but not least, must be mentioned Mr. Terzi's excellent drawings: a splendid pen portrait of Manson from a photograph taken by Dr. Sambon and numerous delineations of parasites drawn with the skill of an expert and the touch of a true artist which characterize the work of this able draughtsman and microscopist who, in 1900, took part in Manson's malaria experiment, and came to London at the express invitation of Sir Patrick Manson.

J. Cantlie.

A SHORT AUTOBIOGRAPHY BY SIR PATRICK MANSON.

(Introduction by Dr. L. W. Sambon.)

Few have been longer or more intimately associated with Manson than the writer; none, outside his family circle, can have felt his loss more keenly. He was a great and worthy man, brilliant scientist, far-sighted physician, capable teacher, good and loyal friend. He had a wonderful mind, sound, clear, logical, inquiring, penetrating. He loved to probe the minutest detail, yet no one held broader views. Few have attacked unsolved problems more successfully. No one ever worked more strenuously, more unselfishly for the good of mankind. Humanity owes a great debt to Manson. Best can it be discharged by doing as he did; urging, aiding, performing, with patient, unremitting endeavour, that medical research work which already has brought into subjection malaria, yellow fever, sleeping sickness, cholera and plague.

Like the majority of successful workers, Manson has had to face disappointment, calumny and ingratitude, but he had the satisfaction of seeing his life-work crowned by success and of receiving the tribute of every good and honourable man.

He leaves in his wake a great school. The men of that school have the Manson spirit; they will carry on his work and their achievements will be as incense to the Master who now has passed into the great unknown.

My constant association with Manson for twenty-five years has enabled me to treasure many interesting recollections of his thoughts, researches and aims. These I purpose to publish some day, and will try to justify the title of "Manson's Boswell" genially given me by Sir James Cantlie. But I have a sketch of Manson's work, dictated to me by himself, a short autobiography, the first part of which—that relating to his earlier and more important discoveries—I am glad to be able to lay before the readers of this Journal. Nothing could be more interesting, more characteristic of the method of his work, the modesty, the kindliness of his nature, the greatness of his genius.

I had read Manson's papers on filariasis, elephantiasis, paragonimus and sparganum and had written of his work, when, one day, I met him in the library of the British Medical Association. Mr. Honeyman, the librarian, who has guided so many of us through the maze of medical literature, came to tell me that Dr. Manson wanted to meet me. Manson congratulated me on my article on acclimatization which had been published a few days before, and I hailed him as a master. We became intimate. I adopted his views on filariasis, elephantiasis, malaria and blackwater fever, he did me the honour of accepting my views on acclimatization, "sunstroke," pellagra, schistosomiasis and hyperparasitism. His leaders on my papers in the *British Medical Journal*, his support at the Royal Geographical Society in 1898 (when I read a paper on acclimatization), his strong and friendly backing at many a meeting of the British Medical Association, the inclusion of my work in his Manual of Tropical Diseases, all this I regard not merely as evidence in favour of my views, but chiefly as proof of his constant desire to help other men in their search after truth.

On one thing only did we ever disagree, and that was sleeping sickness. Manson had found a filaria (*F. perstans*) in the blood of a negro suffering from sleeping sickness, and he thought that this parasite

possibly might be responsible for the disease. Indeed, several facts at the outset seemed to favour this hypothesis. Dr. Low, who had been doing some excellent work on filariasis, was sent forthwith to Uganda, where sleeping sickness was causing havoc, in order to investigate this point. His researches proved that *F. perstans* is a very common blood parasite of the African natives both in affected and healthy districts. Therefore, it could not be held responsible for sleeping sickness, a disease strictly limited in its endemicity. On account of the peculiar patchy, water-edge distribution and other distinctive epidemiological features of the sleeping sickness, I had in my mind already excluded the filaria, but Manson thought me too hasty. When Castellani, who had gone to Uganda at my suggestiou and in my stead, made his all-important discovery—the presence of *Trypanosoma gambiense* in the cerebro-spinal fluid of sleeping sickness cases—the explanation of the distribution of the disease became evident. These facts, coupled with the clinical and pathological similarities of sleeping sickness and nagana, a horse trypanosomiasis of South-east Africa, convinced me that sleeping sickness also must be a tsetse-borne trypanosomiasis. The only thing that remained to be done was to find out a species of glossina whose habitat coincided with the known distribution of sleeping sickness. This was not difficult, and I had no hesitation in incrimiuating the dusky tsetse-fly (*Glossina palpalis*). The researches and experiments of Sir David Bruce, Dr. Nabarro, Professor Brumpt, Professor Minchin and others proved this species to be the carrier of the fell disease, not, however, passively—"just like a vaccinating needle "—as Bruce and others believed, but as a true definitive host. That the tsetse-fly fostered a sexual cycle was evidenced beyond doubt by the gametic differentiation which I was the first to notice in the trypanosomes of sleepiug sickness. Further evidence was furnished by Bruce's experiments on the tsetse-fly transmission of nagana, though the interpretation to be deduced was different from that given by their author.

At the seventy-first meeting of the British Medical Association held in Swansea, in 1903, Manson no longer held to the filaria theory of sleeping sickness, but, warned by the fall of the filaria, he was iuclined to consider the trypanosome also as a mere coincidence. It was then, on this solitary occasion that, not without reluctance, I was obliged to oppose his arguments (see *Medical Record*, New York, August 22, 1903). However, he soon recognized fully the respective parts played by the trypanosome and glossina in the ætiology of sleeping sickness, and, in his book, gave generous recognition to Castellani and Sambon, whose researches, taken together, then afforded a complete elucidation of the sleeping sickness problem.

With regard to *F. perstans*, I recall a somewhat tragic incident in which Manson might have acted the part of a modern Archimedes. He had just discovered the blood form of *F. perstans* in a Congolese, and at once endeavoured to find other Congolese in order to see whether they too harboured the same parasite. Having heard that there was a Congolese lunatic in Hanwell Asylum, he went there, saw the man and found the microfilaria. He paid several visits to the asylum, pricking the man's finger and examining the blood on each occasion. One day, whilst so occupied, the patient —a big, muscular negro—suddenly became violent. "I had just placed a blood film under the microscope," says Manson, "and was adjusting the focus when the lunatic, shouting out 'Have you not had enough yet?' snatched up the microscope and, raising it above his head, was about to brain me. The superinteudent of the asylum, who was present, fortunately, grappled with the maniac and saved me from a fractured skull. Attendants, hearing the scuffle, ran in and removed him, still struggling and shouting, smashing every picture within reach as they rushed him through the corridor."

It was a narrow escape, but Manson lived to complete his work and realize his dream—a school of tropical medicine. I suggested, at the time, that it should be a floating and travelling school. Our first Seamen's Hospital had been a ship, the old *Dreadnought* of Trafalgar fame. Funds were insufficient, however, and the London School of Tropical Medicine began modestly at the Albert Docks, later to be transferred to Endsleigh Gardens, where it now stands a proud monument to Manson's life-work.

I was born at Old Meldrum, Aberdeenshire. My father was a small proprietor or laird and a distiller. I was educated in Aberdeen, where my father removed when his family of nine began to grow up. Here he added banking to his other multifarious occupations.

At the age of fourteen, being keenly interested in mechanics, I joined a large engineering works belonging to my mother's uncle, with the intention of following engineering as a profession. I worked with the men as an ordinary workman. Being a relative and anxious to show them I could do as much as they could, I worked very hard in those days. My hours were from six in the morning to six in the evening and sometimes later. This proved too much for me: curvature of the spine began to develop and a peculiar paretic condition of my right arm which has never left me altogether. My people became anxious about me, physicians were consulted with the result that I was obliged to abandon my work and lie on my back practically all day. Only for two hours was I allowed up and these were devoted to the study of natural history at Murischal College, Aberdeen. At the end of the year the ban against engineering was removed, but, finding that the two sessions (botany and zoology) I had attended counted for the medical curriculum, I decided to become a physician. I studied at Aberdeen and, during two summer sessions, at the Edinburgh University. At the end of the four years, before the age of twenty, I had

passed the examinations, but being too young to obtain my degree, I came up to London and spent my time reading, visiting schools, hospitals and museums. After several months I was appointed Assistant Medical Officer at Durham County Asylum, where there was ample opportunity of finding out how crassly ignorant I was and how terribly inadequate the medical training of those days. I did a great deal of post-mortem work at the asylum and gained experience in administrative work, internal medicine and especially in nervous and mental diseases.

Soon after my twenty-first birthday I was offered an appointment in the Island of Formosa. Being of a restless, adventurous spirit and anxious to see a little of the world, I accepted, in due course to be dumped down on the beach one night at Takau on the south-west coast of Formosa (1866). My practice among Europeans was small, but I had the run of a Chinese hospital and attended daily for five years. Gradually I acquired colloquial acquaintance with the language and a certain amount of familiarity with the diseases of the country. I used to travel about a great deal at times, studying the people, the conditions under which they lived, and the diseases from which they suffered. Of these, elephantiasis, a disease not endemic, but frequently imported, had a peculiar fascination for me. Needless to say, the lonely life and the absence of medical companionship were not very desirable for so young a man, but the interest in professional work kept me out of mischief.

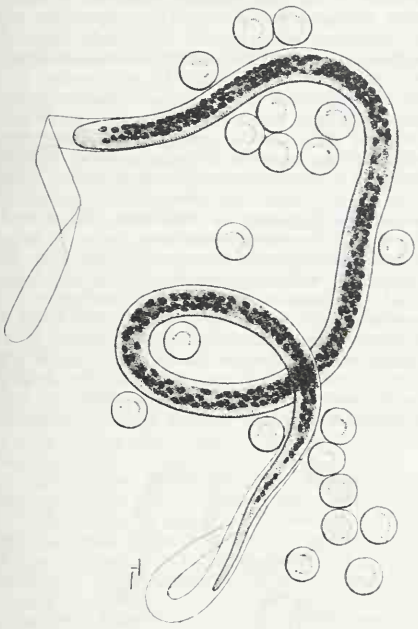
In 1871 I went to Amoy, a large Chinese town with a considerable European colony, and there, when not occupied in practice among Europeans, I devoted the greater part of my time to work in the Chinese hospital. Here leprosy, malaria and a number of diseases, again elephantiasis in particular, which is very common in the neighbourhood, presented themselves for study. I soon acquired a reputation as a surgeon among the natives, especially in the matter of scrotal elephantiasis. Within three years operations on over one hundred cases resulted in the removal of no less than a ton weight of elephantoid scrotal tumour. Elephantiasis, the associated conditions of lymph scrotum and chyluria, of which I had a few cases, prompted the investigation of the ætiology of this group of diseases.

After eight years abroad I returned to England, and worked a little in London, searching out the literature on the diseases that were now interesting to me. Here, for the first time, I read of Lewis's discovery of the *Filaria sanguinis*. In 1875 I married and returned to Amoy. An early endeavour to ascertain if Lewis's filaria occurred there very soon succeeded. Then I set to work to ascertain to what extent the population was infected, and for this purpose trained two of my native dressers in blood examinations. Together we found that round about Amoy at least 10 per cent. of the people were infested, while in other districts the proportion was either lower or very much higher. I remarked that one of the two men who were helping me found very few infected subjects, whilst the other found a much larger number, and I noted that the former did most of his work in the daytime, whilst the other worked in the evening. These observations led to the discovery of filarial periodicity. But thoroughly to establish this, in addition to many shorter observations, a prolonged investigation was undertaken in which blood examinations were made every three hours for six weeks. To do this, I selected two natives who themselves had filaria in their blood, trained them in the use of the microscope and set them to work to examine each other. The result of this examination was conclusive. It was confirmed very quickly by Meyers in Formosa, Mackenzie in London, and Sonsino in Egypt.

Before this discovery of filarial periodicity, the question of how the infection was acquired had been more or less constantly present in my mind. I had been studying a corresponding disease of dogs—*F. immitis*—and recognized, of course, that the blood filaria of man was merely the embryo of a much larger parental form infesting the human body and similar, probably, to that of the dog. How this nematode parasite entered or left the body was a mystery. I knew that eventually the larval filariæ, carried about in the blood-stream must undergo development and become mature. It was evident also that, fettered in sacs (their outstretched, unbroken egg-membranes) and penned within the circulatory maze, they could not, of their own accord, leave the human body; that as there was no evidence either of growth or development so long as they remained within the blood-vessels, there must be some means which effects their removal from the human body and reintroduces them, at an advanced stage of development, into another human body. I set myself to speculate as to what that agency might be which removed and fostered the new-born filariæ. It must be, thought I, something that draws out the blood and therewith the organisms in the blood; moreover, seeing that the filaria is confined to tropical and sub-tropical countries, this something must have a corresponding distribution. What might it be? A tropical blood-sucker. What tropical blood-sucker? The filaria is a common parasite within the tropical belt and, therefore, this blood-sucker must be common there also. For reasons of distribution, season and habits, neither leech, nor flea, nor bug seemed to answer the requirements. Could it be a mosquito, some species of mosquito widespread and common in the tropics? Thus I reasoned. It seemed so important and was so probable that I determined to test the idea experimentally.

One of my own servants, a Chinese, was infected. On negotiation, he agreed for the large sum, to him, of one dollar to submit to mosquito puncture during an undetermined number of nights. Placing him in a mosquito-curtained

enclosure in the evening and, when the number of mosquitoes attracted to the patient by means of a small oil lamp seemed sufficient, I closed the curtain door and left him there till next morning with the attending mosquitoes. Then I collected those mosquitoes which presented abdomens distended with blood, and dissected them, at various periods after they had bitten, by separating with needles the abdomen from the rest of the insect's body and had the great satisfaction of finding numerous filariæ wriggling actively within their stomachs in the contained inspissating blood. Day by day following the development of the filaria parasites within the body of the insect I saw them



Larva of *Filaria bancrofti* in blood of man.

escape from their retaining sacs, migrate from the stomach into other parts of the body, ensconce themselves between the thoracic muscles, become quiescent and, after a series of developmental changes, attain such enormous proportions as eventually to become visible to the naked eye and again to exhibit great activity. I need not say how excited and gratified I was at this discovery; might it not open up new vistas in tropical pathology? My confidence in this mosquito idea was supported by the previous discovery of filarial periodicity, that is to say, the regular disappearance of the filaria embryos from the peripheral blood during the day, their equally regular reappearance in enormous swarms during the night in correlation with the feeding habits of the mosquito alternative host—a marvellous example of adaptation. Naturally, in this work of elucidation, I made many mistakes and drew many false conclusions. It was long before I succeeded in filling in all the details.

Concurrently with this biological work certain forms of lymphatic varix were studied, particularly of the groin glands and scrotum, which seemed to be associated with filaria and were very common in the district. In the vast majority of instances microfilariæ were present not only in the blood, but also in the contents of the varices. Then I found that these pathological conditions were often associated with chyluria, and that the chyluria was generally associated with filaria. So I concluded, I believe correctly, that chyluria depends on a varicose condition of lymphatics. This in turn depends on filaria-produced obstruction in the thoracic duct above the entrance of the chyliferous vessels. Further, I found that these varicose conditions were associated frequently with elephantiasis, although the latter condition was not usually accompanied by filaria in the blood, so, from this and from considerations of geographical distribution, I concluded that elephantiasis probably is a filaria-produced disease. On the mechanical factors producing elephantiasis I have long pondered, but cannot say that I have conclusively determined them.

During this time I investigated a good many other local diseases, but felt the need of books, criticism and medical companionship. For example, a regrettable mistake, the result of a want of books, was my belief that the mosquito died soon after laying her eggs. For this error I was not altogether to blame, for those books of natural history to which I had access gave little or no information about these insects, whilst one misled me by a very positive misstatement. Again in the matter of apparatus I was handicapped. No incubator was available until I had manufactured one out of a kerosene tin and a packing-case. Its odour still pervades my nostrils. Working with some bacterial diseases I had recourse to a sitting fowl as incubator. My cultures, placed in capillary tubes, were sealed and introduced into eggs which, in turn, were placed under the bird. These arrangements were crude, but they served their purpose.

It is curious how, following out a definite line of research, sometimes one makes a startling discovery in a totally different direction. I used to speculate on what became of the microfilaria during its absence from the general circulation, and tested various possibilities which occurred to me by examining blood from different organs obtained during surgical operations. A favourite idea with me was that the larvæ retreated during the day to the pulmonary circulation (which later was found to be the case). To test this suspicion I was constantly on the look out for cases of hæmoptysis occurring during the day. On one occasion

a petty Chinese mandarin came for consultation about an eruption on his hands which proved to be itch. During the examination he coughed and ejected the sputum on to the floor of my consulting room. My disgust and anger at such an exhibition of bad manners evaporated on seeing that the sputum was tinged with blood. "Here," I thought, "is another opportunity," and taking a forceps, I humbly picked up the sputum and trans-

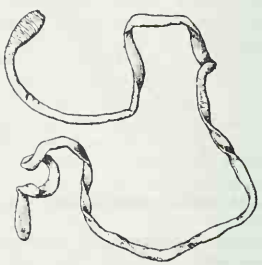
Egg of *Paragonimus westermanii.*

ferred it to the microscope. To my astonishment I found, not the expected filarial embryo, but the operculated ovum of a different and, to me, quite new parasite. I had never seen such a case in the thousands of Chinese I had examined in Amoy. Needless to say, I did not lose sight of the patient and carefully inquired into his previous movements. Finally, I was able to establish that his blood-spitting had been acquired in North Formosa, and that hæmoptysis was an affection by no means uncommon in that part of the island. Some time previously there had been a Portuguese in hospital suffering, as I believed, from thoracic aneurysm. He had left hospital, and I had given him a letter to Dr. Ringer, then in practice in North Formosa, stating my diagnosis, and asking for the subsequent history of the case.

Just about the time I found the egg in the Chinese patient's sputum I got a letter from Dr. Ringer announcing the death of this Portuguese patient from ruptured aneurysm. He added that, in making sections of the lung, he had come across certain minute bodies strange to him. Immediately I wrote back asking him to send me the "bodies," and had the gratification of finding, in the fluid in which these were preserved, ova exactly similar to those I had discovered in the other case. I was not looking for this parasite when I found it, for a man may search for a shilling and find a sovereign. The important thing is to search.

This new parasite was a trematode, the *Paragonimus westermanii*, now well known. I had no difficulty in obtaining an abundant supply of the ova from my Chinese patient as well as from other cases in North Formosa. I used to cogitate on how the parasite gained access to the human subject and thought that by following the destiny of the sputum, the wanderings of the young trematode might be tracked up to a certain point. The sputum is expectorated, it falls on the ground, it is washed by rain into water and from water this fluke somehow gets back to man. So I tried the experiment of incubating the eggs of the parasite in water, and for a fortnight or longer made observations on the ova so incubated, but saw no evidence of development. I put the bottles aside and turned my attention to other matters. About six or eight weeks later I found myself with half an hour's leisure, so, before dinner, remembering the bottles with the ova which I had placed aside, I took them down and examined their contents. I was interested to find the ova now contained a slowly moving ciliated miracidium. The subject has not since advanced much beyond this point, although the affection is known to be very common in Japan, Korea and the Philippines.

The difficulties of obtaining post-mortem examinations in China are almost insuperable. One of my filarial patients was dying of an intercurrent disease. Being eager to find the parental form of the filaria, I offered him two hundred dollars to be handed to his widow for permission to perform a post-mortem dissection of his body. He agreed, and a proper document was drawn up. He had a wife and children who were unprovided for. On his death the widow claimed the money and I was allowed to dissect the body. My brother and I proceeded to the man's house in the very heart of the native town, prepared to spend several hours in search of the parental filaria then not yet discovered. I had hardly commenced the section when we heard an ominous noise outside. A mob had gathered and was anxious to know what the



Sparganum mansoni.

"foreign devils" were doing. We had to run for our lives and I lost my two hundred dollars. Subsequently I succeeded in finding the adult worm in a case of lymph scrotum, but meanwhile Bancroft had anticipated me.

The only other autopsy I ever had the opportunity of performing on a native was done surreptitiously. The case was one of stricture of the œsophagus and, as this condition is very

common in and about Amoy, I was anxious to see the local condition. During this examination I found the Dibothriocephalid larva now called *Sparganum mansoni*. Partial post-mortem examinations I have done on the sly, but these were, of course, very unsatisfactory.

Being denied the opportunity of necropsies in man, I had to make use of dogs, cats and birds of various sorts. In the course of these examinations a great variety of hæmatozoal parasites were found. Even in this branch of research native prejudice often proved obstructive. I had found that the blood of the magpie contained at least two species of filaria, so I procured as many of these birds as possible, but the Chinese told me I must stop my work in this direction, because the magpie is a sacred bird in China, tradition holding that, many centuries ago, the spirit of a defunct Emperor had entered one of these birds. Therefore it was possible that either I or my friends might shoot this particular fowl. I don't know that this absolutely deterred me, but the birds themselves, which, under ordinary conditions are remarkably tame in China, soon got to know when I was after them.

A friend who kept a poultry yard in which he took great interest was very solicitous about the health of his birds. Suddenly, without obvious cause, the birds as well as other live stock about his house, began to die in great numbers. In such a community as ours then was, the medical man is appealed to in veterinary matters; accordingly, my friend asked me to diagnose the nature of the trouble. I dissected some of the fowls and experimented with their body fluids. I found that by inoculating a very little of the blood into a healthy fowl a disease often fatal within twenty-four hours was induced.

Here I came across a curious parasite living on the eye of the fowl. These worms, numbering six to eight or ten in each eye, lie parallel and closely approximated to one another just below the *membrana nictitans*. A large proportion of fowls was affected. The parasite I sent to Cobbold, who named it *Filaria mansoni*, now it is known as *Oxyspirura mansoni*. It has a wide geographical range.

I was miserably equipped with microscopes and consequently, overlooked many things which otherwise I might have seen. Leprosy I believed to be a parasitic disease, and that the parasite resided in the leproma. To test this idea, I devised a plan, by which the juice of the leproma, without the admixture of blood could be obtained. In this juice I saw the *Bacillus lepræ*. This was before Hansen's discovery, but so little confidence had I in myself as a bacteriologist that I dared not publish the result of my investigations, which remained buried in a notebook. Later, after Hansen's discovery and the introduction of Koch's methods demonstrating the acid-fast bacilli, I found a way of obtaining what I called lepra-juice in the comparatively pure form which was of use for demonstration and diagnosis. I took great interest also in epiphytic skin diseases so common in the unwashed and two observations of some value were made. These were that certain forms of *Pityriasis versicolor* owed their black appearance to the presence of a dark pigment in the causative fungus, an observation confirmed subsequently by Castellani, who named the disease *Pityriasis nigra*, and the causative fungus *Cladosporium mansoni*. But the ringworm which interested me most was the one I called *Tinea imbricata*. This occurs occasionally in Chinese emigrants returning to Amoy from the Straits Settlements and similar hot-damp climates. I was struck with the peculiar and, if I may use the expression for so loathsome a thing as an epiphytic skin disease, beautiful pattern it produces in the skin and endeavoured to account for it. I noticed that the fungus, proliferating profusely beneath the epidermis, raises and peels this off as it advances, much as a spade does when it raises the turf of a lawn. I got two students to submit to inoculation and had the satisfaction of witnessing the evolution of the concentric circles commencing from the central point of inoculation reproduced in spreading and ever expanding series. This observation has been confirmed amply.

In Amoy, and subsequently in Hong-Kong, my attention was directed to the fevers and gastro-intestinal troubles, especially to one hitherto neglected, but very important disease, for which I borrowed the Dutch name Sprue. Unfortunately, although I managed to bring together the leading clinical features of the disease, its cause eluded me, and it still remains to be discovered.

A skin disease of some interest which is particularly common, occurring in epidemics in Hong-Kong, especially among children, is what I called *Pemphigus contagiosus*. In many respects it closely resembles *Impetigo contagiosum*, but is not the same, and I regarded it as the result of a diplococcus which proliferates and can be found easily in the lesions.

I often look back with great pleasure to my residence in Amoy. There was plenty of work and, during the greater part of the year, the climate was delightful. In the winter it is dry and bracing, in summer very hot, but the heat is tempered by the sea breezes during the day and the land breezes at night. European houses are large and cool, each in its own tropical garden. The little island on which Amoy stands is well provided with roads, has an excellent club and all kinds of recreation. The Chinese population are kindly, hard-working, and, in many ways, intensely interesting. Once a year or thereabout a trip up the Kui-lung River into the interior, for sport or exploration, produced a welcome break in what otherwise might have been a monotonous life.

The Chinese hospital, however, was the principal source of interest to me, where, on several days of the week, I spent my forenoon and on Saturday, the afternoon operating and investigating. It was my laboratory, my school. There I gained whatever experience and knowledge I may possess of tropical medicine.

AN APPRECIATION OF SIR PATRICK MANSON.

By Sir Frederick Mott, K.B.E., F.R.S., M.D., LL.D., F.R.C.P.

Sir Patrick Manson came to me one day in 1899 and suggested that I should accompany him to the East London Mission, where there happened to be two cases of so-called negro lethargy. With a view of investigating the disease, we brought them away in a cab to Charing Cross Hospital, where they were placed under our combined care. It was observed that their cervical glands were enlarged, and some of these were removed under an anæsthetic for the purpose of finding out whether they contained any micro-organism. None was found, and cultures prepared from these glands proved sterile. Sir Patrick examined the blood and here found *Microfilaria perstans* in one of the cases. I believe that was the reason why he held for a long time that *Filaria perstans* might be the cause of the disease. It was a very natural mistake to make, because this filariid is very common in the blood of natives throughout tropical Africa. I have found it myself in a number of the brains of cases which I have had the opportunity of examining. Whether Manson mistook for embryo filariæ the trypanosomes he must have seen in the many blood-films prepared from these two cases I do not know. Possibly, like so many other careful observers, he missed them because he was after bigger game. *F. perstans* at the time dominated his attention. I tried to get Manson to have lumbar puncture made in these cases, and when one died I examined the cerebro-spinal fluid and observed in a hanging drop a rapidly moving organism which I had never seen before, but which I now know was a trypanosome. This was mentioned in my paper with Manson on "African Lethargy" in the Sleeping Sickness *Transactions* of the Pathological Society of London, vol. li, 1900.

When I read my paper and showed the microscopic specimens of the brains of these two cases, Dr. Stephen Mackenzie stated he had described a case in vol. xxiv of the Society's *Transactions* ten years previously. He was kind enough to let me examine the sections of the brain, and I found they showed a very marked meningo-encephalitis similar in every respect to the two cases which died in Charing Cross Hospital. I had the opportunity of examining the brain of a white woman who had died of trypanosomiasis, and thus, at a time when sleeping sickness was believed to be a disease peculiar to the African negro, and therefore called negro lethargy, I was able to show that the white man is also liable to this infection.

There is no doubt that Manson's enthusiasm led to Castellani being sent out to Uganda, together with Drs. Low and Christie, to investigate the sleeping sickness which there was ravaging and almost depopulating certain districts round the Victoria Nyanza. I suggested to Castellani that he should examine the cerebro-spinal fluid. This he did, and found trypanosomes, and it is well to mention that in the fourth volume of the Reports of the Sleeping Sickness Commision the following statement is made:—

"When Col. Bruce and Dr. Nabarro arrived in Entebbe on March 16, 1903, Dr. Castellani had observed these hæmatozoa in the cerebro-spinal fluid of five cases of sleeping sickness, and in one of these he had also seen them in the blood."

"Before he left for England on April 6, thirty-four cases of sleeping sickness and twelve controls had been examined with a positive result in 70 per cent. of the former and a negative result in the latter."

"This most interesting discovery of Dr. Castellani, which was due to his introduction of the method of centrifuging the cerebro-spinal fluid in his search for his streptococcus, has been of the utmost possible value to the Commision. It put them at once on the right track, and led to the rapid elucidation of the ætiology of this hitherto mysterious disease. Without a knowledge of his observations they might have worked for months in the dark, and in truth, they might even have returned to England still ignorant as to the true cause of the disease."

The Commission under the direction of Col. Bruce continued the investigation, and showed that the streptococcus to which Castellani had attached great importance as a cause of the disease was a secondary microbial infection, and by further clinical observation the trypanosome was found to be invariably present in the cerebro-spinal fluid. It was also shown that the disease could be produced experimentally in monkeys by tsetse-flies which had been allowed to feed on patients suffering with sleeping sickness. The brains of many of these animals were sent to me, together with the brains of twenty-seven cases of human beings who had died of the disease. All the brains of the human beings showed the characteristic chronic meningo-encephalitis, but I could never find a definite trypanosome in the sections. A number of the brains of the monkeys which were said to have died of sleeping sickness did not show the characteristic perivascular lymphocyte reaction. At last one did show a characteristic condition. Possibly the animals that did not show the change died before there was time for it to occur. Possibly the flies after feeding on the sufferers with sleeping sickness did not carry the infection, a sufficient time not having elapsed for the trypanosome to multiply in the fly. The Commission showed that the regional distribution of the fly and the disease corresponded. Thus Bruce is credited with the discovery of the cause of sleeping sickness, for he discarded entirely the streptococcal theory of the Portuguese which Castellani favoured, and by continuing and extending the clinical investigation, by experimental and epidemiological research he showed that the two essential factors for sleeping sickness were the trypanosome and the biting fly, *Glossina palpalis*. Sleeping sickness is, in truth, a human tsetse-fly disease.

Manson was a good and reliable friend, always willing and eager to help the younger men. I well remember, when he was President of the Epidemiological Society, telling him of the difficulties I had in making the authorities and the superintendents consider the subject of epidemic dysentery in asylums. He arranged that a discussion should take place and I was asked to introduce the subject. I think it was his influence and that of the late Sir Victor Horsley which obtained for me shortly afterwards the Stewart prize for the best work on epidemiology. He was quite certain that it was the bacillary form of dysentery that he himself had seen in asylums both here and abroad.

To show his enthusiasm in the work that Ross was carrying out in India, I have in my possession now a number of the mosquitoes which Ross had sent to him. Manson brought them down to the pathological laboratory at Claybury and demonstrated to me the parasites in their stomachs. A rather amusing incident occurred shortly after. Mr. John Burns came to the laboratory, when I told him about the parasite of malaria and how it was carried by the mosquito. He was very doubtful because, as he said, whilst engaged as an engineer on the Gold Coast, he had actually seen the miasm come up, and he thought this was the cause of malaria. But as he was always an energetic loyal supporter of scientific work, I have no doubt he soon changed his views.

I well remember Manson telling me that it was owing to Joseph Chamberlain's intervention that the Royal Society took up the subject of tropical disease.

I think it may be said truly that Manson is the founder of tropical medicine, and by his recognition of the supreme importance of investigating the cause of malaria and of sleeping sickness, he was instrumental in interesting the Colonial Secretary and of inducing him to promote researches at home and abroad. Although his ideas regarding the causes of these two diseases proved to be wrong, undoubtedly they paved the way which led to the very important discoveries of Ross and Bruce.

AN APPRECIATION OF SIR PATRICK MANSON AS A BACTERIOLOGIST.

By R. Tanner Hewlett, M.D., F.R.C.P., M.R.C.S.

In more or less constant touch with Sir Patrick Manson from about 1896 until his retirement from the active staff of the School of Tropical Medicine, I had an opportunity of following his interests in connection with bacterial diseases. It is true that his interests, as well as his discoveries, mainly centred upon the protozoan and helminthic parasites, I believe for two reasons (1) because he had the foresight to recognize what an important part these classes of parasites play in diseases of the tropics, and (2) because he believed the diseases caused by them were more likely to prove amenable to prevention and cure than bacterial diseases. Nevertheless, he never lost touch with bacterial diseases, and I well remember the interest he took in one of the earliest cases of plague admitted to the Albert Dock Hospital (about 1898), and the bacteriological findings of the examination which I had the privilege of carrying out. Bacillary dysentery, mycetoma and leprosy were other bacterial diseases research in which he followed closely. He had an unfortunate experience with undulant fever which caused him to lose faith in the bacteriologists to some extent, and he was wont to poke fun at them in a good-humoured manner on occasions. A specimen of undulant fever serum was sent to two experienced bacteriologists for agglutination tests, with the result that one returned it positive, the other negative.

I think that all those who were in touch with Manson to the last must have marvelled, as I did, at the grasp he had of all problems connected with tropical diseases—prevention and cure, pathology and parasitology—and how he was ever ready to plan some new adventure whereby a particular problem might be elucidated. Truly we have lost a great master and a great man.

AN APPRECIATION OF SIR PATRICK MANSON AS A DERMATOLOGIST.

By J. M. H. Macleod, M.A., M.D., C.M., F.R.C.P.

Whatever the branch of medicine which attracted Manson's attention, it was illuminated by his keenness of observation. When dermatology was in its infancy as a special branch of medicine, and was barely recognized, Manson saw its importance, and in the early editions of his text-book he devoted a special section to the description of skin diseases in the tropics. When the London School of Tropical Medicine was founded, Manson still further showed his recognition of the importance of the subject by making dermatology part of the curriculum and by appointing a special lecturer on that subject. Here we have an instance of Manson's great foresight when we consider that this was done in 1898, while the great examining bodies of England have only awakened this year to the necessity of incorporating it as an essential part of the curriculum.

It is now nearly twenty years since the writer, as a lecturer in the Tropical School, became associated with Manson. During that time the interest which that great teacher took in every phase of the work was not only an encouragement but an inspiration. There was no subject in connection with tropical skin diseases in which Manson was not interested, and over and over again he pointed out flaws in our knowledge and indicated a path by which some problem could be solved.

His descriptions of the different skin diseases he met with in the tropics are all that could be desired, both in their clarity and the sound common sense

which characterized his treatment. As was to be expected, some of his nomenclature has been superseded, but that is of small moment; for example, his pemphigus contagiosus is now known as streptococcal bullous impetigo, while the term dhobie itch is now confined to the first of the three conditions which he included under that heading, namely, body ringworm, erythrasma and pemphigus contagiosus. His best known original contribution to tropical dermatology was his brilliant and detailed account of *Tinea imbricata*.

His inquiring mind forced him to take nothing for granted, but always to try and find a cause, and as a result what he has done for the advancement of tropical dermatology is as great in proportion as that he achieved for the advancement of medicine in general.

MANSON'S PART IN HELMINTHOLOGICAL DISCOVERY.

By H. A. Baylis, M.A., D.Sc.

British Museum (Natural History).

The late Sir Patrick Manson enjoyed remarkable opportunities during his residence in Formosa, at Amoy, China, and elsewhere, of studying the worm parasites which play so important a part in tropical pathology. He availed himself fully of these opportunities, and the result was a number of interesting and valuable discoveries and some happy suggestions which have since proved stepping-stones to further discovery in the field of medical helminthology.

Unfortunately some of Manson's opinions met with considerable opposition in certain quarters, and the effects of this are still discernible in comparatively recent literature. In the remarks which follow the writer has endeavoured to confine himself as far as possible to plain statements of fact, and has been at pains to avoid any semblance of partisanship on any question that may still be regarded as controversial. An attempt is made to trace briefly the history and significance of some of the more important of the worm parasites that Manson discovered or described, or concerning which he added to the sum of our knowledge. It is hoped that mention has been made of the majority of the species with which Manson's name is more particularly associated.

Paragonimus westermanii (Kerbert, 1878).

In 1878 Kerbert described, under the name of *Distoma westermanii*, a trematode from the lungs of two tigers which had died in captivity in Europe. Very soon after this Ringer found, post-mortem, similar worms in the lungs of a Portuguese patient of Manson's in North Formosa. He forwarded them to Manson, who in turn submitted them to Cobbold. The latter published some account of the worm in 1880, naming it *Distoma ringeri*. Manson had previously observed the ova in the sputum of a Chinaman, also from North Formosa. They were also seen by Baelz in Japan in cases of hæmoptysis. He at first mistook them for gregarines, but on submitting some of them to Leuckart, and being informed that they were the eggs of a trematode, he, in 1883, proposed the name *Distoma pulmonale* for the worm.

Manson, therefore, appears to have been the first to discover the infection in man. The question whether the worms found in man are identical with those from the tiger and other hosts is, perhaps, still open to doubt, and upon it depends the nomenclature of the human parasite. The writer is greatly indebted to Lt.-Col. Clayton Lane, M.D., who has recently investigated the available evidence, for placing his as yet unpublished results freely at his disposal. From these it appears that there is not sufficient evidence to justify the erection of a separate species for the human parasite. Many of the differences supposed to exist between the "species" are based upon features subject to alteration by muscular contraction or different methods of preservation, and may therefore be left out of account. Geographical distribution is an unsafe guide in the case of parasites of man and of domesticated animals, and the differences said to exist in the form and arrangement of the cuticular spines require fuller investigation with the aid of abundant material. According to Kobayashi, much variation occurs in one locality alone (Korea). We may therefore take it, for the present, that the human parasite is identical with the original *P. westermanii*.

The worm[1] occurs in the adult stage in man, the pig, cat, dog, tiger and leopard cat, and of these the pig is in all probability the most usual host. It has also been recorded for cattle. Perroncito, writing in 1913, claims that trematodes found by him in the lungs of cattle in Italy, and reported upon by Rivolta in 1868, belonged to this species. If this is correct, this would be the earliest record of the parasite. At the time of Rivolta's report, however, the worms were regarded as "erratic" specimens of *Fasciola hepatica*.

The geographical distribution of paragonimiasis in man is mainly oriental, the infestation occurring in Japan, Formosa, Korea, China, the Philippines, and elsewhere. Pigs are commonly infested in America.

The life-history of the worm remains imperfectly known. Manson observed the miracidia that emerge from the eggs, and kept them alive in water for over twenty-four hours. It has been stated by Japanese workers that the life-history comprises two intermediate hosts, the first being a snail (various species of *Melania*), and the second a crab or crayfish (*Potamon, Sesarma, Eriocheir, Astacus*). The experimental evidence is not, however, very convincing.

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[1] A distinct species, *P. kellicotti*, has been proposed by Ward for the form occurring in the pig, dog and cat in North America, but it appears to be open to the same objections as *P. ringeri*.

In its definitive host the parasite occurs mainly in the lungs, but may also invade various other organs and tissues, even including the brain, and may set up various inflammatory and suppurative lesions. In the case of invasion of the intestine, a form of dysentery may result. Cerebral paragonimiasis gives rise to epileptic fits and other nervous disturbances, and usually terminates fatally.

The genus *Paragonimus* was established by Braun in 1899, with *P.* [*Distoma*] *westermanii* as type-species. The other species included were *P. compactus* (Cobbold, 1859), from the lungs of mongooses, and *P. rudis* (Diesing, 1850), from the Brazilian otter. A trematode from a reptile (*P. trachysauri* MacCallum, 1921, from the gall-bladder of the stump-tailed lizard, *Trachysaurus rugosus*), has also been assigned to the genus, but from the description of its anatomy its inclusion here seems questionable.

Schistosoma mansoni Sambon, 1907.

An interesting case of human schistosomiasis was recorded by Manson in this Journal in 1902. It was this case, in the first instance, that led to the ultimate recognition of *Schistosoma mansoni* as a distinct species. The patient was an Englishman who had resided for some years in the West Indies. Hitherto, although it had been observed that there were two types of Schistosome egg, one with a terminal and one with a lateral spine, and that the latter was associated rather with dysenteric cases than with cases in which the urinary system was involved, it had not been seriously maintained that the species producing these two kinds of eggs were zoologically distinct. Manson, in reporting upon his case in 1902, was too cautious to suggest the specificity of the lateral-spined eggs which alone were observed. In the following year, however, he did make the suggestion that there might possibly be two species of *Schistosoma*, and in 1907 Sambon took up the subject, and designated the species producing the lateral-spined eggs as *S. mansoni*.

At that time the available evidence in favour of the distinction between this form and *S. hæmatobium* was rather scanty, and there followed much controversy, in which Looss took a prominent part, maintaining that the lateral-spined eggs were abnormal or unfertilized eggs of *S. hæmatobium*. The form of the eggs, the geographical distribution, and the site of the lesions in the body of the host, were the characters upon which the new species was originally based. That its separation from *S. hæmatobium* was justified has now been shown by the finding of satisfactory anatomical differences between the adult worms. These differences were pointed out in 1916 by Leiper, who was able to demonstrate them in material obtained from experimentally infected mice, and also to show that the two forms of eggs do actually correspond with the two forms of adult worms.

Recent work on the life-histories of the three human species of *Schistosoma* is so abundant, and for the most part so well known, as scarcely to require mention here. Experiments carried out by Leiper tend to show that in Egypt snails of different genera function as intermediate hosts for the two species occurring there (*S. hæmatobium* and *S. mansoni*). *Planorbis boissyi* is the only snail in which, up to the present, the cercaria of *S. mansoni* is known to develop in Egypt. In South Africa, however, it has recently been stated by Cawston and by Porter to occur in *Planorbis pfeifferi*, *Physopsis africana* and *Isidora tropica*. In Brazil it has been recorded in *Planorbis olivaceus*, *P. guadeloupensis* and *P. centimetralis* by Lutz, and in Venezuela, in *P. guadeloupensis* by Iturbe and González.

Infection of the definitive host appears to take place in the same way as in the case of *S. hæmatobium*, by the active penetration of the cercariæ through the skin or mucous membrane. The adults of all Schistosomes live in the blood-vessels, and their pathological effects are mainly due to the occlusion of small vessels and the escape of the eggs through their walls. The lesions caused in the intestinal mucosa by *S. mansoni* may give rise to dysenteric symptoms of a more or less serious order. Its ova may also be found in the liver, whence they may give rise to cirrhosis.

S. mansoni has a wide geographical distribution, occurring in Egypt, South Africa, South America, and the West Indies. It has also lately been reported as of fairly common occurrence in Madagascar. In some countries, such as Egypt and South Africa, *S. hæmatobium* and *S. mansoni* are found together, and mixed infections may occur. In others, *S. mansoni* seems to be the only species present. This is the case in South America and in the West Indies, the source of Manson's historic case. Here only lateral-spined eggs are found, and they occur in the fæces, not in the urine, of the cases.

The third species of *Schistosoma* affecting man, *S. japonicum*, the cause of "Katayama" disease, was discovered in Japan in 1904 by Katsurada, and what is considered to be the same species was found in a Chinaman by Catto in the same year, and was named *S. cattoi* by Blanchard in 1905.. *S. japonicum* is mainly prevalent among the Japanese and Chinese populations. It also occurs in the Philippines, and is probably of wide Oriental distribution. As in the case of *S. mansoni*, its ova, which differ considerably in shape from those of the other species, are found in the fæces.

In addition to the three forms occurring in man, the following species of *Schistosoma* have been described from other mammalian hosts:—

S. bomfordi Montgomery, 1906, parasitic in *Bos indicus*.

S. bovis (Sonsino, 1876), in cattle and sheep.

S. indicum Montgomery, 1906, in the donkey.

S. spindalis Montgomery, 1906, in *Bos indicus*, and also (Liston and Soparkar, 1918) experimentally in the goat.

S. turkestanicum Skrjabin, 1913, in cattle.

The *Bilharzia magna* of Cobbold, 1859, from a monkey, is probably the same as one of the human species.

Some more or less closely related forms also occur in birds, but are not now placed in the genus *Schistosoma*.

Sparganum mansoni (Cobbold, 1883).

In 1882 Manson discovered in the peritoneum and abdominal cavity of a Chinaman at Amoy several specimens of an immature cestode. These were described by Cobbold in the following year, under the name of *Ligula mansoni*. Shortly afterwards material from a Japanese case was also described by Leuckart, under the name of *Bothriocephalus liguloides*. *L. mansoni* was referred by Stiles and Tayler in 1902 to the group of worms named *Sparganum* by Diesing in 1854. The name *Sparganum*, now commonly used for the forms found in man and similar forms in many other animals, was applied by Diesing to several plerocercoid larvæ of cestodes of the Pseudophyllidean type, and is really an artificial group comprising forms of which the adult stage is unknown.

Cases of human infestation with worms similar to Manson's have frequently been recorded, chiefly in Japan. The worms have been found in the subcutaneous connective tissue, where they may cause swellings and abscesses; also beneath the conjunctiva and in the urethra. They are capable of considerable migration within the body, and their presence in the last-named situation is probably due to their having effected an entrance into the urinary passages, and being on the way to the exterior with the urine.

A parasite taken by Baxter from an abscess in the thigh of a Masai, in East Africa, was described by Sambon in 1907 as a distinct species, *S. baxteri*,[1] on the ground of its occurrence in a different zoogeographical region. Another has been recorded by Daniels from British Guiana.

Sparganum proliferum (Ijima, 1905), which also occurs in man, and has been found mainly in Japan, but also in Florida, appears to be quite distinct from the forms already mentioned. It has been placed by Stiles in a distinct "subgenus," *Gatesius*. It assumes a remarkably irregular shape, instead of the typical simple, ribbon-like form, and seems to be capable of multiplication by a process of budding and dispersion in the larval stage. In this way large numbers of the worms become scattered about in the connective tissue of the body, and may give rise to a painful and serious condition. The worms become enclosed in cysts, which are formed of the host's tissue and ultimately become very thick and hard.

Nothing is known of the life-history of these parasites. Forms which are provisionally referred to as *Sparganum* have been found in an immense variety of hosts besides man. It is impossible to review them here. Carnivorous mammals, such as cats, foxes, weasels and otters, also monkeys and some birds, figure in the list of hosts; but these worms are perhaps more common in snakes than in any other group of vertebrates. We have no satisfactory means at present of distinguishing such larval forms belonging to different species, so that it is impossible to say whether any of those found in lower animals are identical with the *S. mansoni* of man. Also we are completely ignorant of their subsequent history. Presumably they develop into a sexual form when the intermediate host is eaten by an appropriate definitive host, but hitherto none of the adult forms of Pseudophyllidea known has been definitely connected with *Sparganum*.

Various Filariidæ.

The subject of filariasis is so large that it is impossible here to do more than mention some of the discoveries in which Manson played a more or less important part. The researches of Manson on filariasis are classical, particularly with regard to "filarial periodicity," and with regard to the part played by mosquitoes in the life-history of the worms.

In March, 1878, an important paper by Manson was communicated by Cobbold to the Linnean Society. It was the first account of the establishment of the fact that a mosquito acted as intermediate host, or, as Manson termed it, "nurse," to the "*Filaria sanguinis hominis*." Manson, working in China, had, in the previous year, not only obtained experimental proof of the theory that the mosquito carried the parasite, but also traced the stages of development of the parasite within the mosquito. He did not succeed in explaining how the embryos, after this development, reached the blood of man again, but supposed that they escaped into water when the mosquito died and fell into it, and that through the medium of the water man became infected with them.

Light was thrown upon this question later by Low, to whom Manson had entrusted material sent to him by Bancroft. Low showed that the larvæ, at the end of their metamorphosis in the mosquito, migrate towards its proboscis, and Lebredo and others have shown how they escape by their own efforts and penetrate the skin of persons bitten by the mosquito. Manson thus paved the way for all subsequent investigations on the mode of transmission of filariasis, and his work has had a profound effect on our knowledge of all diseases transmitted by blood-sucking insects.

Further, it was Manson who, about the year 1880, pointed out the fact that in certain infections with "*Filaria sanguinis hominis*" the embryos were often temporarily absent from the peripheral

[1] The figure of Sambon's specimen has appeared under different names in some of the well-known text-books of tropical medicine. Thus in Manson's "Tropical Diseases" it is used to illustrate the article on *S. mansoni*, and it also represents this species in Brumpt's "Précis de Parasitologie," 1913. In Castellani and Chalmers' "Manual," however, it is called *S. baxteri*.

blood. In 1883[1] he published an important work on "The *Filaria sanguinis hominis*," in which (besides much other valuable research) he gave a detailed account of his observations on cases in which the embryos became abundant in the peripheral blood during the night, and were absent or very scarce during the day. He showed that during the day they accumulated in the more deeply-seated blood-vessels, and more particularly in the lungs, and also pointed out that their periodicity was a direct adaptation to the habits of the night-feeding mosquitoes.

The filarial embryos with this nocturnal periodicity were distinguished by Manson in 1891 by the name of *F. sanguinis hominis nocturna*, and belong to the species which we now know as *F. bancrofti* Cobbold, 1877. Manson played a large part in the early researches on elephantiasis and other forms of disease that appear to be associated with this parasite.

The species whose microfilariæ Manson, in 1891, termed *F. sanguinis hominis diurna*, on account of their diurnal periodicity, we now know as *Loa loa* (Guyot, 1778). The worm is common in West Africa, and is perhaps best known on account of the wandering habits of the adult under the skin of the human host, its not infrequent invasion of the conjunctiva and neighbouring regions, and its supposed responsibility for the condition known as "Calabar swellings."

Manson suggested in 1895 that the "mangrove flies," of which *Chrysops* is one, might possibly serve as transmitters of this worm. Annett, Dutton and Elliot, in 1901, contending that "*Filaria diurna*" was simply *F. nocturna* with a reversed periodicty, put forward the counter-suggestion that the carrier might be a mosquito of diurnal habits. In neither case was positive evidence adduced to prove the contention. Other workers have, more recently, supported Manson's view, but it remained for the researches of A. and S. L. M. Connal, published only last year, to furnish entirely satisfactory proof of its soundness.

These workers conducted feeding-experiments with a large number of flies of two species, *Chrysops silacea* and *C. dimidiata*. The flies were allowed to suck blood from cases of infection with *Loa loa*, and it was found that of some 150 flies subsequently dissected all had been successfully infected with the embryos. These results were of course controlled by the examination of unfed flies. It was further shown that the embryos migrated through the stomach-wall of the fly and came to rest among the muscles, as in the case of *F. bancrofti* and others. They remain here for some days, during which their development proceeds, and then move towards the base of the proboscis, through which they eventually escape, the fly itself assisting in the process with its legs. In this way the larval worms are deposited on the skin of persons attacked or settled upon by the fly, and they appear to penetrate the skin by their own independent action. Manson's original suggestion has thus been fully corroborated and followed out to its conclusion.

The name *Filaria sanguinis hominis perstans* was given by Manson in 1892 to a microfilaria occurring in the blood of negroes from the Congo, and characterized by the absence of "periodicity." Adult worms considered to be of the same species were subsequently found by Daniels in British Guiana, and the species was referred by Railliet, Henry and Langeron, in 1912, to the genus *Acanthocheilonema* of Cobbold. The life-history remains imperfectly known.

In 1897 Manson found filarial embryos in the blood of natives of St. Vincent, West Indies, and named them *Filaria demarquayi*. They attracted his attention on account of certain differences in size and appearance from *Microfilaria bancrofti* and *M. loa*, and because they exhibited no periodicity in their appearance in the peripheral blood. The adult female was later found by Galgey in St. Lucia, in the omentum of a patient whose blood contained similar embryos.

The embryo named *Filaria ozzardi* by Manson, also in 1897, were found by him in blood-films from native Indians of British Guiana. He believed them to be different from *F. demarquayi*, but they are now considered by prominent authorities to be identical. Whether this be so or not is, perhaps, a question which should remain open until more abundant and well-preserved material of the adults of both sexes has been obtained and thoroughly investigated. At present opinion appears to be divided between *demarquayi* and *ozzardi* as the correct name for the species (supposing that it is all one). The name *demarquayi* had, according to Railliet, been used independently by Zune five years before Manson applied it to his worm, and Zune's worm was shown to be in reality *F. bancrofti*. The name *demarquayi*, therefore, according to rule, must lapse, and Railliet in 1908 proposed the new name *juncea* to replace it for Manson's worm. If, however, the facts are as stated, *ozzardi* still remains as the correct name.

It may be mentioned here that the name *Filaria mansoni* was used by Huber in 1896 for "*F. sanguinis hominis*," but has no zoological validity. A microfilaria from the blood of a lizard, *Mabuia carinata*, in Ceylon, was also named *Filaria mansoni* in Manson's honour by Castellani and Willey in 1904, but this use of the name is also invalid under the rules of nomenclature.

Oxyspirura mansoni (Cobbold, 1879).

This nematode, which infests the eyes of fowls and of other galliform birds, was first noticed by Manson at Amoy. He forwarded an account of its occurrence in the fowl, and the head of an infested bird, to Cobbold, who gave it the name *Filaria mansoni* in 1879. The worm has since been observed

[1] The book was a reprint of several papers of earlier date, mostly published in the China Customs Medical Reports.

in Brazil, the Dutch Indies, Mauritius, Annam, Jamaica and Florida. Dr. Sambon has mentioned to the writer that he saw the worm in Barbados, where it was pointed out to him by Dr. William B. H. Massiah. It is also said to be common in Honolulu.[1] A curious fact that has been remarked upon is that the infestation usually seems to occur in localities not far distant from the sea-coast. A closely related form, *O. parvovum* Sweet, 1919, occurs in Queensland.

Affected birds, if not successfully treated in time, exhibit a more or less severe conjunctivitis, sometimes leading to the complete destruction of the eye, ulceration of the orbit and nasal cavities, and the death of the bird.

"Manson's eye worm of chickens" was made the subject of an important monograph by Ransom in 1904. He placed the species in the genus *Oxyspirura* v. Drasche. His attempts to infect healthy birds with the embryonated ova were not successful, and as yet we have no satisfactory account of the life-history. Ransom embodied in his paper a catalogue of all the nematodes known to occur in the eyes of birds.

Railliet, in 1916, placed *Oxyspirura* in a new family, *Thelaziidæ*, most of the members of which inhabit the orbital region of mammals or birds. About six other species, besides those already mentioned as occurring in domesticated poultry, are referred with some certainty to the same genus. They occur in or near the eyes of various wild birds. A number of imperfectly known forms may also eventually be shown to belong to the group.

THE CARRIERS OF *FILARIA BANCROFTI*.[2]

By F. W. Edwards.

In the year 1900 there were (allowing for synonyms since ascertained) not more than 110 species of mosquitoes recorded from all parts of the world, while of these there were not half a dozen whose life-histories were known. At the present time the number of known species is certainly over 1,100, while something at least is known of the habits and early stages of more than half of these. It is indeed doubtful whether any family of insects is better known than the Culicidæ. This striking increase in our knowledge is of course almost entirely due to the stimulus to study provided by the demonstrations of the part played by mosquitoes in spreading human disease, particularly malaria. In connection with the present memorial to the late Sir Patrick Manson, it is fitting to recall that one of the earliest of these demonstrations, which entirely confirmed the results just previously arrived at by other workers, was carried out at Manson's suggestion and under his direction. I refer to the classic experiments of Sambon and Low in the Roman Campagna in 1900, on the transmission of malaria by *Anopheles maculipennis*.

Apart from the Roman experiments, however, Manson will always be remembered as having been the first to prove the connection between mosquitoes and any disease by his work on filarial worms at Amoy in 1877-8. There can never be any question that this work was the inspiration of much of what was done later. Therefore, although Manson never made any direct contribution to the morphology or biology of mosquitoes, students of these insects are certainly deeply in his debt. His early work has, of course, been completed and extended since by others. It is not the present writer's province to review any of this work, which is mainly the concern of helminthologists and medical men. Possibly, however, it may be of some use to list the various species of mosquitoes which have been shown to act as intermediate hosts of *Filaria bancrofti* and those which have been examined with negative results.

I.—Mosquitoes in which complete development has been observed.

(1) *Culex fatigans*, Wied (=*C. quinquefasciatus* of American writers).—There can hardly be a doubt that this was the species with which Manson's original experiments were made. Some have suggested that he worked with *C. pipiens*, L., but this is not known to occur, and probably does not occur, so far south in China. *C. fatigans* is now recognized as by far the most important carrier of *Filaria bancrofti*, its suitability having been repeatedly demonstrated. It is an almost universal associate of man in tropical lands, its larvæ breeding in small collections of water in or near houses, and the females feeding at night. Very recently its known range has been extended to New Zealand, where it has been found by Mr. D. Miller. It does not occur in Europe or in North Africa, so that the filariasis which has been reported from Egypt and Morocco must be transmitted by some other species—possibly by the very closely allied *C. pipiens*, which seems in the Mediterranean region to be more bloodthirsty than it is in Northern Europe.

(2) *Aedes* (*Stegomyia*) *variegatus* (Doleschell). Synonyms: *Culex scutellaris*, Walker, nec Theobald; *Stegomyia pseudo-scutellaris* (Theobald).—Bahr has shown that in Fiji this species is an even better transmitter of *F. bancrofti* than is *C. fatigans*, which also occurs on the islands; though the *Stegomyia*, like other highly ornamented species, is a daytime biter, in connection with which the filarial worms show a reversed periodicity. *Aedes variegatus* is another domestic or semi-domestic species, very widespread in the tropical

[1] Since these notes were written, Lieutenant-Colonel Clayton has referred, at a meeting of the Royal Society of Tropical Medicine and Hygiene, to the occurrence of *O. mansoni* among material collected by Dr. F. W. O'Connor in some of the islands of the Samoan group.

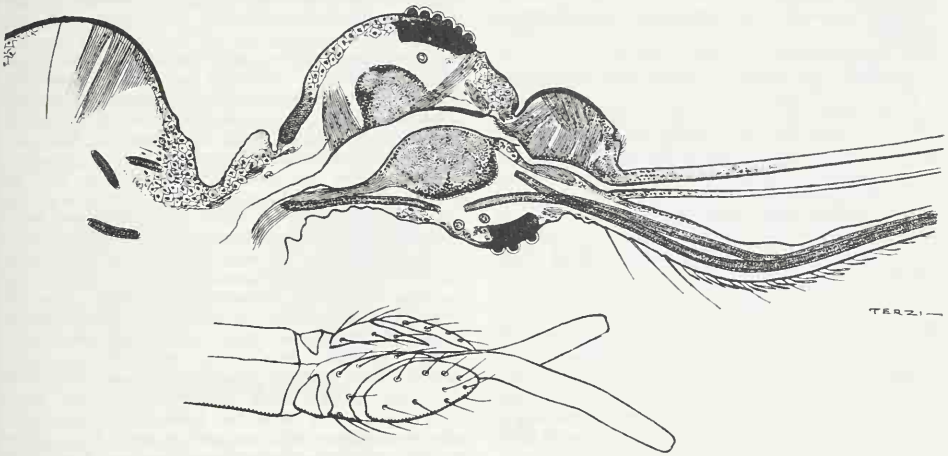
[2] Published by permission of the Trustees of the British Museum.

parts of the Australasian region, Christmas Island (S. of Java), Amboyna, Aru Is., New Guinea, Fiji, Samoa, New Hebrides, Solomon Is., and doubtless other Pacific islands.

(3) *Aedes* (*Finlaya*) *togoi* (Theobald).—Yamada has recently shown (*Annot. Zool. Jap.*, x, p. 46, 1921) that this is an efficient carrier in Japan. This mosquito, again, is a semi-domestic species, occurring throughout Japan, and also recorded from Eastern Siberia.

(4) *Taeniorhynchus* (*Mansonioides*) *africanus* (Theobald).—Either this or the closely allied and frequently associated *T.* (*M.*) *uniformis* Theo. has been found to be a carrier in tropical Africa. common semi-domestic species, and occurs throughout tropical Africa. It appears to be the Ethiopian representative of the oriental *A. rossi*.

(7) *Anopheles* (*Anopheles*) *algeriensis* (Theo.).—Mentioned by Seurat (*Arch. Inst. Pasteur Tunis*, x, No. 4, December, 1918) as a host of *F. bancrofti* in Tunis on the authority of Weiss (1912: no reference given). *A. algeriensis* is a rather uncommon species, extending almost all round the Mediterranean, and recorded from Mesopotamia. It has been confused with *A. bifurcatus* L., which also occurs over the same area, as well as throughout Europe, and it is not quite certain to which of these Seurat's record refers. *A. algeriensis* is



Filaria bancrofti. Two specimens actively migrating through labium of *Culex fatigans*. (From sections prepared by Dr. G. C. Low).

Although only a partial development was observed by Daniels, Lt.-Col. Alcock has slide mounts showing proboscis infection. *T. africanus* is very widespread in tropical Africa, and though not strictly a domestic species is extremely abundant in large swamps, and enters houses in some numbers for the purpose of obtaining blood. The remarkable structure and habits of the larvæ, which live attached to the roots of the floating water plant, *Pistia stratiotes*, from which they obtain their air, have been described by Ingram and Macfie.

(5) *Anopheles* (*Myzomyia*) *rossi* (Giles) (? *subpictus*, Grassi).—Found by James to be a carrier in India, where it is the commonest semi-domestic Anopheline, occurring also throughout the greater part of the oriental region.

(6) *Anopheles* (*Myzomyia*) *costalis* (Theo.) (? Loew).—Found by Annett, Dutton and Elliott to be a carrier in West Africa. This, again, is a probably not numerous enough in most Mediterranean countries to be a serious factor in the transmission of the worms.

II.—Species in which partial development only has been observed.

The following list has merely been compiled from those given by Howard, Dyer and Knab (1912), Hindle (1914), and Castellani and Chalmers (1919). Some of the species in this list will doubtless be proved eventually to be good carriers, but in the case of *Aedes argenteus* (*Stegomyia fasciata*) it seems definitely established that complete development does not take place. This is not surprising, since *A. argenteus* is the almost universal associate of *C. fatigans*, but is mainly a daytime biter, and would therefore be less liable to infection and have less chance of developing a fixed relation with the worms where these latter have a definite day and night periodicity.

Culex sitiens, Wied (syn. *jepsoni*, Theo; *microannulatus*, Theo).

C. bitæniorhynchus, Giles (syn. *Tæniorhynchus* Leic.).

C. gelidus, Theobald.

Aedes (*Stegomyia*) *albopictus* (Skuse) syn. *Culex albopictus*, Skuse; *Stegomyia scutellaris*, Theobald nec Walker).

A (*S.*) *galloisi*, Yamada.

A. (*S.*) *chemulpœnsis*, Yamada.

A. (*S.*) *argenteus* (Poiret) (*Stegomyia fasciata*).

A. (*S.*) *perplexa*, Leicester.

A. (*S.*) *desmotes*, Giles (syn. *S. gracilis*, Leicester).

A. (*S.*) *albolineatus*, Theo.

A. (*Ochlerotatus*) *caspius* (Pallas) (syn. *Culex penicillaris*, Rond.).

Tæniorhynchus (*Tæniorhynchus*) *pseudotitillans*, Theobald.

T. (*mansoniodes*) *annulipes*, Walker.

Anopheles (*Anopheles*) *maculipennis*, Meigen.

A. (*A.*) *bifurcatus*, Linn.

A. (*A.*) *hyrcanus* (Pallas) syn. (*sinensis*, Wied).

A. (*A.*) *hyrcanus* var. *vanus*, Walker (syn. *Myzorhynchus nigerrimus*, Giles; *M. minutus*, Theo.; *A. pseudopictus*, Grassi).

A. (*A.*) *hyrcanus* var. *peditæniatus*, Leicester.

A. (*A.*) *barbirostris*, v.d. Wulp.

A. (*Myzomyia*) *annulipes*, Walker.

A. (*Nyssorhynchus*) *albimanus*, Wied (syn. *albipes*, Theo.).

A. (*N.*) *argyrotarsis*, R.-D.

III.—Species examined, with Negative Results.

The following species are given by Castellani and Chalmers, Leicester, and Yamada, as having been tested for development of *F. bancrofti*, but with negative results. The evidence for non-development of the worms seems in some cases to be fairly definite.

* *Culex sitiens*, Wied (? syn. *annulirostris*, Skuse). *Mucidus alternans* (Westwood) (syn. *C. hispidosus*, Skuse).

Armigeres (*Armigeres*) *obturbans* (Walker).

A. (*A.*) *jugrænsis* (Leicester).

A. (*A.*) *Leicesteria*) *flava* (Leicester).

A. (*L.*) *dolichocephala*, Leicester.

A. (*L.*) *annulitarsis*, Leicester.

Heizmannia metallica (Leicester).

Aedes (*Finlaya*) *notoscriptus* (Skuse).

A. (*skusea* ?) *amerii*, Ludlow (syn. *Stegomyia fusca*, Leic.).

A. (*Ochlerotatus*) *vigilax* (Skuse) (? also recorded as *C. nigrithorax* and *C. procax*).

A. (*Aedes*) *butleri*, Theobald.

A. (*A.*) *croensis*, Yamada.

* *Anopheles* (*Anopheles*) *maculipennis*, Mg.

A. (*Myzomyia*) *funestus*, Giles.

* *A.* (*M.*) *annulipes*, Walker (syn. *musivus*, Skuse).

* These species also appear in the list of those in which partial development has been observed.

TROPICAL AND SUB-TROPICAL DISEASES.[1]

By Louis Westenra Sambon, M.D., F.Z.S.
Lecturer to the London School of Tropical Medicine.

Having accepted the honour of addressing you, I have chosen as my subject the elucidation and prevention of tropical diseases.

Twenty years ago (March 13, 1900), Dr. (now Sir Patrick) Manson came before you and told you that an experiment was going to be made to test the mosquito theory of malaria. Some of you will remember how he ventured to prophesy that the experiment would prove mosquitoes to be the carriers and disseminators of malarial infection, and show that, under normal conditions, the intermittent fevers are not contracted in any other way than through inoculation of the parasite by the phlebotomizing organs of previously infected mosquitoes.

The Colonial Office and the London School of Tropical Medicine entrusted me with the carrying out of the experiment and you know that it was successful, that it proved the truth of Manson's anticipation, and that it demonstrated the preventable nature of the malarial scourge.

Few stories are more interesting than that of man's struggle with malaria. The parasites of our intermittent fevers, of which there are three well-defined species, must have come into being long before the advent of man such as we know him now. The family Plasmodidæ, to which they belong, has a wide zoological distribution. Species closely allied to those of man occur in mammals (apes, monkeys, bats, dogs, oxen, horses, squirrels), birds (sparrows, blackbirds, owls, pigeons, partridges), and reptiles (lizards, tortoises). Some of the host animals, such as geckos and bats, have long shared with man his habitations: the cave, the tree-shelter and the reed or mud hut. It is possible that the plasmodium parasites of some of these may prove interchangeable between them and man. Parasites very similar to those of human malaria are common in the young of anthropoid apes, while both the apes and the various races of mankind may have inherited them from a common ancestral stock living in the latter part of the Oligocene period, when, some two million years ago, man and ape began to differentiate, the precursory forms of the common ancestor probably having acquired them during Eocene or Jurassic times. The cosmopolitan range and wide zoological distribution of the Plasmodidæ are certainly in favour of an early pretertiary origin.

The earliest traditions, the earliest records, the earliest monuments show man wrestling with the fever fiend. Herakles fighting the Hydra, Apollo slaying the Python, betoken the struggles of Phœnician and early Greek colonists on African,

[1] Paper read at a meeting of the Royal Colonial Institute at Central Hall, Westminster, on Tuesday, January 27, 1920, Sir Patrick Manson, G.C.M.G., M.D., F.R.S., in the Chair, and reprinted by permission from *United Empire* for August and September, 1920.

Asiatic and Mediterranean shores. The striking resemblance of the Hydra to a "flagellating" malaria parasite is, doubtless, accidental, but we marvel at the knowledge of the Ancients concerning malaria. Five centuries before our era, Hippocrates clearly outlined the three main types of intermittent fever: quartan, tertian and subtertian; a Babylonian clay tablet, baked over 3,000 years ago, now in the British Museum, bears, in cuneiform signs, the name of the "Fever-Fly"; one of the most beautiful coins of Greek Sicily—a silver tetradrachm struck by the town of Selinus in honour of Empedocles—commemorates the elimination of malaria by drainage; Peruvian aborigines, long before their conquest, used red cinchona bark (the source of quinine) in the treatment of intermittent fevers, and the ancient Egyptians employed cotton netting as a protection against mosquitoes. It was at Canopus, on the western mouth of the Nile, that Cæsar's legions first saw mosquito curtains used to bar the fever fly. The Romans adopted and introduced them into Europe. Juvenal describes the *canopeum* as a close-meshed net of cotton, and several Latin authors deride the effeminacy of soldiers using them in the field. In

Coin of the ancient Sicilian town of Selinus (Magna Grecia), struck in honour of Empedocles.

Britain "canopies" were still employed in the sixteenth century, when ague was rife in our fen districts, for we find the bedstead with a "net for knattes" listed in an inventory of furniture taken at the Abbey of Sawtry in 1537.

In all ages and places, within the vast range of malaria, we meet the same belief in the existence of a connection between mosquitoes and intermittent fevers. Vaguely mentioned, in the first century, by the Roman agriculturist Columella and the Indian surgeon Susruta, tentatively expressed in 1717 by Lancisi, physician-in-ordinary to Pope Clement XI, boldly asserted by Dr. Josiah Nott of Mobile in 1848, and argumentatively exposed by King of Washington in 1883, it is strongly supported in 1884 by Laveran, the discoverer of the malaria parasite. In 1885, Norris tells us that the Japanese have long ascribed paludal fevers to the attacks of mosquitoes, and Koch mentions the same conviction among East African natives who have but one word (*Mbù*) to express both malaria and its mosquito vector, just as Gallas, Abyssinians and Somalis have one word (*Courdoud*) to indicate relapsing fever and its tick carrier. But for the precise, scientific evidence which led to the establishment of the mosquito theory of malaria we must come down to Manson.

It has been my fortune to be able to follow step by step the unfolding of this great discovery. Let me tell it as briefly as possible.

I have heard Professor Laveran relate how he began his researches at Bône, in Algeria, in 1878, how he discovered the cause of malaria to be an amœba-like organism that lives in the red-blood corpuscles like Fruit-fly maggots in Morello cherries, engulfing the blood-cell protoplasm and forming dark excrementitious granules, then how, at last, on November 6, 1880, he felt justified in crying out *Eureka!* On that memorable day he was in the Military Hospital of Constantine, patiently examining the blood of malaria patients. He had been watching a peculiar brownian-like commotion of the black granules in one of the small spherical bodies escaped from its host-cell and wished he could convince others that the tiny body, quivering beneath his one-sixth inch lens, did really move and live, when suddenly, it projected two, three, five long slender tentacles which began to wave about viciously, lashing, displacing and twisting the surrounding blood corpuscles as one might turn, double and roll pancakes There could be no further doubt as to the animate nature of the malaria germ, and Laveran sent a short note of his observations, which was read on November 23, 1880, at the Paris Academy of Medicine.

Some of Laveran's bodies had been described by Meckel in 1847; they had been pencilled by Virchow in 1849 and by Frerichs in 1866, but no one had suspected their true nature. Indeed, the medical world did not believe them to be parasitic protozoa until several years after Laveran's brilliant exposition. Yet, in 1846, a great Italian physician, Rasori had written: "For many years I have held that the intermittent fevers are produced by parasites which renew the paroxysm by the act of their reproduction, which recurs sooner or later, according to the variety of their species," and Varro, in his book on Agriculture, written in 37 B.C., had said: "It is necessary to avoid swampy places, because they dry up in summer and give birth to certain minute animals, invisible to the eye, which enter into the body with the air by way of the mouth or the nostrils and cause grave diseases."

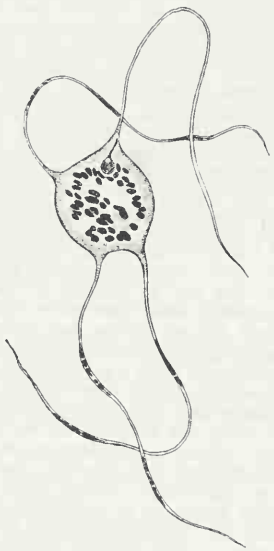
In 1884, Gerhardt succeeded in transferring the disease to healthy individuals by inoculation of malarious blood and thus proved that it is a true infection.

At first, the Italian physicians obstinately maintained that Laveran's intracellular bodies, their sporulation stages, their free flagellating forms, their excrementitious granules, were merely evidences of cell degeneration; but later, abandoning these views, they contributed handsomely to our knowledge of the morphology and biology of the Plasmodidæ. In 1885, Professor Golgi of Pavia proved that tertian and quartan fevers are not only clinically dissimilar, but that their respective causative agents are also specifically different and,

soon after, Celli and Marchiafava demonstrated the specific nature of the parasite of subtertian fever, a fever the separate nature and gravity of which had been very clearly indicated by Celsus, a famous encyclopædist of the first century.

The most interesting episode in the elucidation of malaria is undoubtedly the demonstration of the long-suspected part played by the mosquito in its occurrence. It is the work of many, but foremost are Manson, Ross and Grassi.

I was introduced to Manson in January, 1897, at the library of the British Medical Association. I had just published in the *British Medical Journal* an article on the Acclimatization of Europeans in Tropical Lands, in which I tried to prove, against almost universal opinion, that it is parasitism, not



"Flagellated body."

climate, that destroys the white man in the tropics, and Manson had written a powerful leader in favour of my paper. He asked me to luncheon, and we spent the afternoon in his laboratory, among books, jars and phials, beneath the portraits of Hunter and Carlyle, examining the fresh blood films of a subtertian fever patient who had happened to call.

Manson breathed on one of the blood preparations and allowed it to stand awhile, then, carefully dropping on it a thin cover-glass and ringing it with vaseline, he adjusted the slide to the mechanical stage of his microscope. By turns, we looked through it and, watching some of the more hyaline crescent-shaped bodies in the zone of heaped-up corpuscles, saw them become spherical, saw their dark granules begin to oscillate, then turmoil in a frenzied state, as if the very vitals of the parasites were in ebullition. Suddenly, four or five long whip-like processes shot out and began lashing furiously. Those were the same bodies which had enabled Laveran to prove the livingness of the malaria parasite. Remarkably did they resemble the hydræ on ancient gems, the symbol of Greek engravers to represent the Lernean malaria scourge, vanquished by Jupiter's son. And Herakles was there, on the spot, in the shape of a plump phagocyte which made short work of the many-headed parasite.

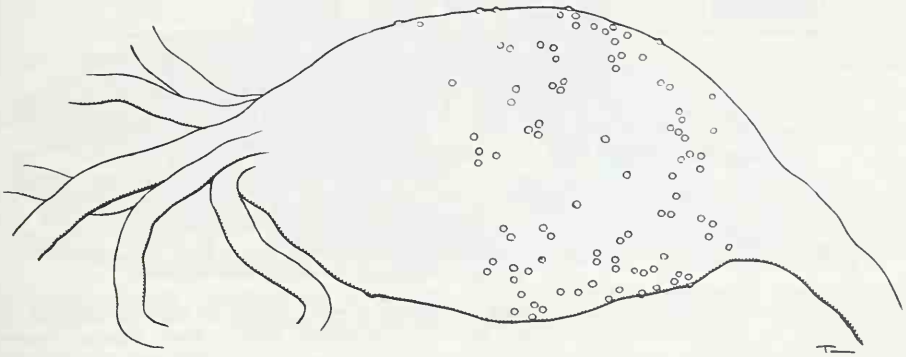
'Are these semblances of degeneration and death?" asked Manson, alluding to the opinion of the Italian school, and I agreed that they seemed rather to be the prelude to some further stage in the life-cycle of the parasite. Then he told me of the mosquito theory he had formulated and published in the *British Medical Journal* in 1894. It was based on that type of bodies we were at the moment examining, the "flagellated bodies," as they were called then. Seeing that the emission of flagella (or male sexual elements, as MacCullum subsequently (1898) showed them to be), occurred only in blood after abstraction from the body, and never within the blood-vessels, it must represent an extra-corporeal phase, so far as man was concerned. He had shown that these blood parasites could not leave the body of their human host without aid from outside. This agent must be some blood-sucking insect, and, for reasons of distribution, seasonal incidence and habits, he thought the mosquito to be the most likely one.

Twenty years before, in China, he had proved that the mosquito is the alternative host of *Filaria bancrofti*, a widespread species of filiform, round worm, the adults of which inhabit the lymphatics of man and give rise to various morbid manifestations, among which is elephantiasis. He had seen the blood-haunting, sack-enclosed larvæ of the filaria, which had been sucked up by mosquitoes with the blood from filaria-infected patients, bogged in coagulating blood within the insect's stomach, break their fettering sacks, bore their way into the body cavity and reach the thoracic muscles; here to settle for a period of growth, then again to migrate to drop into water, and, possibly with this element, or otherwise, gain entrance into a new human host. As the physical conditions of the malaria parasite and its biological requirements closely resemble those of the filaria larva, something similar, he thought, probably occurred in the case of malaria, and, unable from circumstances himself to follow up this idea in the tropics, he told me how Major (now Sir Ronald) Ross, then a surgeon in the Indian Medical Service, was about to investigate his hypothesis.

Major Ross returned to India and at once started work. In 1897 he discovered the early encysted form, or oöcyst, of the subtertian parasite in the stomach wall of certain undetermined "dappled-winged mosquitoes," no doubt Anophelines which

previously he had fed on malaria patients, and he sent specimens to Manson which we examined eagerly. Then came a period of difficulties. Thwarted by man and nature, Ross was unable to continue his investigations into human malaria, but, undaunted and following a suggestion made by Manson, he turned his attention to the Plasmodidæ of birds. He found in the common grey mosquito (*Culex fatigans*), fed on the living blood of sparrows or larks harbouring malaria parasites (*Plasmodium danilewskyi*), bodies similar to those of the subtertian fever he had seen already in "dappled-winged mosquitoes." It remained now to follow up the evolution of the oöcyst, and this Ross did with the avian parasite. He found that it increased considerably in size, divided repeatedly within, and became full of filiform bodies; then burst the containing capsule and poured out its multitudinous progeny into the body cavity of the insect host. Finally, he saw these filiform bodies, meeting. It was a great day for the absent Ross, and we cheered him rapturously. It was a day of thankfulness and rejoicing for the whole of mankind, because, owing to the establishment of the mosquito theory, one of the greatest of disease scourges had been made preventable. It was the day of Manson's triumph, but he said nothing of the all-important part he had played in the matter.

Repeating Ross's researches and experiments with the parasites of human malaria and with mosquitoes of the genus Anopheles, Grassi, Bignami and Bastianelli were able to prove that the parasites of human malaria (*Plasmodium vivax*, *P. malariæ* and *Laverania malariæ*) go through precisely the same migrations and evolutions as the avian malaria parasite (*Plasmodium danilewskyi*) within the body of the grey mosquito (*Culex fatigans*). Our present knowledge undoubtedly shows that Ross's "dappled-winged mosquitoes" were Anophelines, but for having



Stomach of *Culex fatigans* with oöcyst of *Plasmodium danilewskyi*.

or sporozoites, accumulate within the cells of the salivary glands and discovered that they actually passed down the salivary ducts into the puncture made by the feeding mosquito, thus causing infection in a fresh avian host.

The last details of Ross's work reached London in July, 1897, just before the meeting of the British Medical Association. Manson was suffering from a severe attack of gout, but, this notwithstanding, he travelled to Edinburgh with Dr. (now Sir James) Cantlie and myself, to announce that, partly by direct observation, partly by analogy, Ross had proved that the malaria parasites of man undergo a necessary stage of development within the bodies of mosquitoes, and that these insects do indeed transfer the malaria infection eventually from man to man. On arrival, Manson was so ill that he had to lie in bed unable to move, so I took down the address he had been asked to give on the mosquito-malarial theory. The next morning we helped him, still suffering, to the

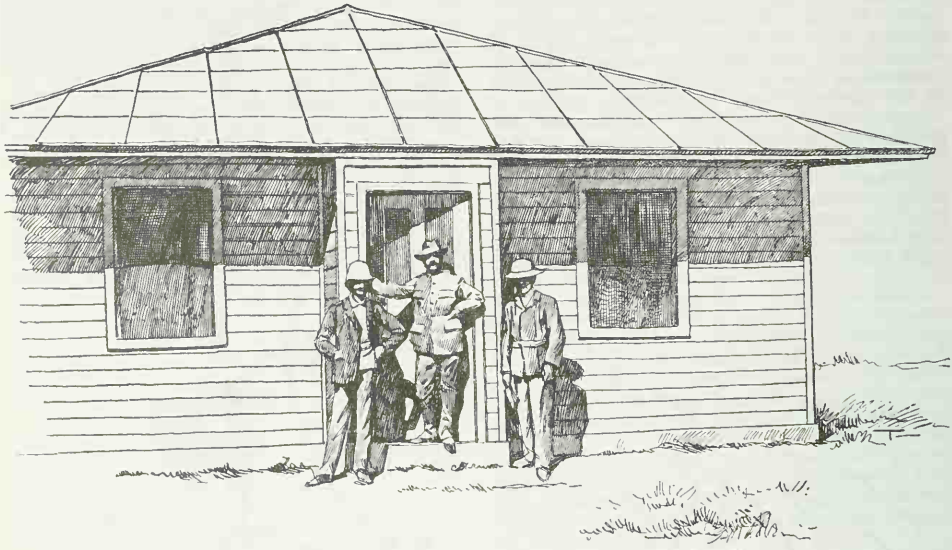
clearly indicated this sub-family of the Culicidæ as the only carriers of human malaria credit is due to Professor Grassi.

The experiments made by the Italian physicians were almost conclusive, but they had drawbacks. They were made in Rome, which, though now usually free from the disease, is in the very centre of an intensely malarious region, therefore it was conceivable the infection might have been conveyed through some channel other than the mosquito.

In the course of an informal conference which I arranged in Rome, in 1899, between the Italian investigators and a party consisting of Sir Clifford Allbutt, Sir Lauder Brunton, Drs. Manson, Cantlie, Gibson, Mr. Louis Taylor and myself, it occurred to us that a careful experiment by British investigators, carried out in the Roman Campagna, might prove useful at home in establishing thoroughly the truth of the mosquito-malaria theory, in confuting scepticism, and in leading to the adoption of the practical measures so evidently indicated. Pro-

fessor Bacelli, the Italian Minister of Public Instruction, to whom the project was submitted, promised his hearty support.

Planned by Manson, the experiment was to consist of two separate tests which would prove the mosquito-malaria theory—one in a direct positive manner, the other by negative inference. Should both succeed, no reasonable argument could be brought against the theory.



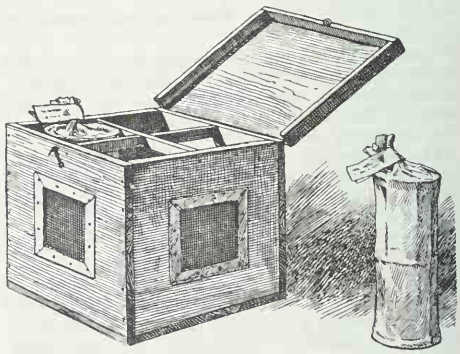
British experimental hut at Ostia (Roman Campagna). June-October, 1900.

For the first test, mosquitoes reared and infected abroad would be sent to London and there allowed to bite a man who had neither had malaria nor had ever been exposed to malarial infection. For the second test, two such men would go to the Roman Campagna and there, in a district notoriously and severely malarious, live throughout a fever season protected only against mosquito-bites. For this they would be provided with a mosquito-proof hut.

Manson's son, Patrick Thurburn Manson, nobly volunteered to be bitten by the infected insects, and Dr. Low, then a research student, now a teacher in the London School of Tropical Medicine, assisted me in the second test.

King Humbert, who took keen interest in our experiment, allowed me to erect the mosquito-proof hut in one of his game preserves at the edge of a vast swamp in the district of Ostia, close to the mouth of the Tiber.

In digging the foundation for our building, we unearthed a Roman tomb, made of large terra-cotta slabs, in which lay the skeleton of a young woman. Beneath the skull was a coin of the Emperor Commodus, the toll-money that had been placed under her tongue to pay old Charon for ferrying her over the Styx. Our workmen crossed themselves and muttered. Had she died in the spring of life a victim of Saturn's daughter, the cruel subtertian fever? From Plautus, Terence,



Gauze tubes suggested by cobwebs and box, in which malaria infected mosquitoes travelled from Ostia to London.

Cicero, Horace and Pliny we learn that malarial fevers were rife in the Campagna of their time when

the "Land of Saturn," as it was called, was a vast park studded with noble villas.

I should like to tell you how we lived in the desolate Campagna; how we collected Anopheline mosquitoes for the experiment, as they emerged from their pupa-cases on the margins of the Porto swamp, once Trajan's famous hexagonal dock; how seeing cobweb-curtains sheltering mosquitoes, blown by the wind, as I opened a stable door gave me the idea for a suitable travelling cage in which to send the infected insects to London; how we followed the development of the "Cruel Filaria" (*Filaria immitus*) of dogs in Anopheline mosquitoes fed on famished mongrel hounds who came to our compound and elected to guard our hut; how, after sunset, swarms of wild Mosquito-Mænads stormed our wire gauze windows, whirling and humming in a frenzy of blood-lust; how we discovered the smaller kind of "red-water fever" parasite of cattle, alongside with the larger one (*Babesia bigemina*) in the long-horned, silver-coated oxen of the Campagna; how we studied the habits of the Wolf-spider or Tarantula (*Lycosa tarantula*), the bite of which is said to cause frantic dancing, and which the peasants treat with music; how we found a new species of mammal (*Talpa Romana*) at the very doors of Rome and many other interesting things, which time will not permit me to narrate here. But I have three letters, written to me by Manson, which give the story of the experiment in a few words. Let me quote them.

The first is dated London, July 3, 1900, and says:—

"My dear Sambon,—The mosquitoes arrived in fine condition on Sunday. I got your wire on Saturday, and on Sunday Warren met the mail. No mosquitoes. He missed them. They turned up later, however, and when I got to the School on Monday I found them all alive and kicking. Not quite all alive; I saw one or two corpses, but your splendid arrangements for portage and housing have been most successful, and you have solved the problem of transport at the first shot."

The second letter is dated London, September 18, 1900. It says:—

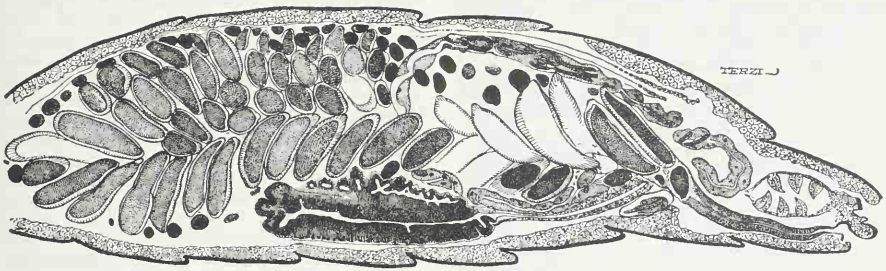
"My dear Sambon,—Though dead tired I cannot go to bed without telling you of the phenomenal success of the other part of the experiment. I telegraphed you yesterday, but I thought you would like to have some details.

"You know Burnie was bitten by the Roman mosquitoes about the beginning of July, again at the end of August, and again about ten days ago. He kept quite well until last Thursday, the 13th. That morning he got up feeling cheap; temperature 99. During the day his temperature rose to 102, but as blood examination revealed no parasites, I did not permit myself even to hope. Next day the same—continued fever of 100 to 101·8 and febrile feelings; still no parasites. On Saturday, 15th, his temperature was 99 in the morning and he felt well; no parasites. At 2 p.m. he was so well that I went down to Chalfont. I was seedy, gouty and influenzal. On Saturday evening, as we sat down to dinner, I received a telegram from Edie saying that Burnie had high fever. When I got home on Monday morning, Burnie was sitting up feeling well though played out, and he told me that on Saturday night temperature after chills had gone up to 104 and that he had delirium. The fever ended in profuse drenching sweat. Sunday forenoon he was quite well, but the same fever recurred on Sunday afternoon. When I examined his blood, in a few minutes I found the tertian parasite—half grown, some pigmented leucocytes. It was a case of *Eureka!* indeed. Many blood examinations only confirmed the first finding. Monday—yesterday—afternoon again fever to 103. I got six men to verify the observation, telegraphed to you and others, and when the temperature began to fall, about 9 p.m., gave him ten grains of quinine. He has been taking quinine since, and though there are still a few parasites in his blood, including gametes, he is now quite well and examining his own blood.

"This, of course, is immense, and together with your success proves our points up to the hilt."

The third letter says:—

"My dear Sambon,—The latest development of the inoculation business is very striking. After



Abdomen of *Anopheles maculipennis*, with fully developed ova, showing larvæ of *Dirofilaria immitis* developing within Malpighian tubes (from a section prepared by Dr. G. C. Low).

Burnie fell ill there were some mosquitoes still living. Warren (laboratory assistant at the London School of Tropical Medicine) thought it would be a pity to waste them, so he fed the insects on his own arm. Two days ago he had a temperature of 104 and showed plenty of parasites in his blood. Is not this striking and satisfactory? Last week's *Lancet* and *British Medical Journal* had my paper on the experiments; perhaps you have seen it. The business is booming very much just at present and I am inundated with interviewers. I wish you were here to take the flood. I have had no reply as yet from Government about taking action. I suppose Chamberlain is so full of the elections that he has no time to go into the matter."

During our stay in Ostia we were visited by many eminent Italian and foreign physicians. Amongst them were Professors Celli, Grassi, Bastianelli, Rossi, Postempsky, Plehn and Supitza. Professor Grassi sent the following telegram to Manson: "Assembled in British experimental hut, having witnessed perfect health experimenters amidst malarial-stricken inhabitants—Italian physicians congratulate Manson, who first clearly formulated mosquito-malarial theory.—Grassi."

I have been long, I trust not tedious, over malaria, but few diseases are more widespread, more prevalent, more disastrous. It occurs in all parts of the world, only sparing high mountain, polar ice and waterless desert. It is most prevalent in marshy regions and, though its distribution be discontinuous and its permanent areas generally limited, under favourable œcological conditions it may extend its range and, in certain years, give rise to great epidemics. Figures regarding its ravages are astounding. Celli estimated that in Italy it caused an average annual mortality of 15,000, representing about two million cases. India claims an annual tribute of no fewer than a million lives. In 1900 the United States of America lost 14,900 lives from malaria, and Howard estimates that the annual money loss from this disease in the United States is not less than $100,000,000.

Malaria is the disease best and longest known, but little is being done at the present day to prevent it. The Ancients had it well under control. Many parts of Sicily, Italy, and the Balkan Peninsula, now reconquered by the fever-reeking jungle, were centuries ago the seats of healthy and prosperous States. Previously they had been malaria stations.

Go now to the South of Italy, stop at Cotrone, once famous for the number and strength of its athletes, the beauty and grace of its women, the skill of its physicians, and you will find that the cruel Malaria-Circe has sadly transformed its people. Go to Paestum and you will find it deserted and buried in swamp and jungle; the three great Posidonian temples still stand in majesty, silhouetted against the crimson of a sunset sky, only to shelter the three Malaria Demons: Tertian, Quartan and Subtertian.

Whilst we were carrying out our malaria experiment in the Latin "fever land," an American army medical commission was grappling with yellow fever in the Island of Cuba. Few diseases are more fatal than this hæmorrhagic fever, which has been termed "the hurricane of the human frame." Nothing proves its deadly nature more strikingly than the story of the French expedition to Santo Domingo in 1802. When General Leclerc left Brest, the effective strength of his army was 58,545 men. In less than four months over 50,000 had been killed mainly by yellow fever, and seven years later, when the army returned to France, it numbered only 300 men!

Hitherto most authors have regarded yellow fever as a Central American or Antillean disease. It appears that Cortez found it in Mexico, and Humboldt suggested that it might be the *Matlazahuatl* of the old Mexicans. If we trace backwards the history of yellow fever epidemics, we shall find the greater outbreaks recurring regularly in the same manner up to the middle of the seventeenth century. Similar outbreaks, though imperfectly described by Herrera, Oviedo, Gomara and Peter Martyr, carry the sequence further back until we reach the first on record, which occurred in Santo Domingo in 1494, soon after the landfall of Columbus. These also were no doubt yellow fever. Other writers have long proclaimed the African origin of the disease and, indeed, we now know that endemic yellow fever, unrecognized or kept secret, is the factor which gives "West African fever" its swift, fearful deadliness. We cannot decide yet whether it originated in the Ethiopian or in the Neo-tropical Region, but, when we come to know something of its zoological distribution in vertebrates, I think we shall find that, like malaria, relapsing fever, typhus and other cosmopolitan diseases, it is equally ancient on both sides of the Atlantic, an ocean, comparatively recent, which came into being at the end of the Cretaceous period, and separated Africa and Eurasia from the Americas. In 1913, when I was in the Island of Trinidad, an outbreak of yellow fever occurred and it was reported that some of the Red Howler monkeys (*Alouatta senicula*) had died of it. The concomitance of fatal disease in dogs, cats, horses, hogs, rats, foxes, pumas, parrots, and especially monkeys, during yellow fever outbreaks has often been recorded. The known transmitting agent of the disease, the silver-striped Tiger Mosquito (*Aedes calopus*), is widely distributed throughout the tropics.

It was a French physician in British Guiana, Louis Daniel Beauperthuy, who, in 1853, first clearly incriminated the "house-haunting mosquito" as the propagator of yellow fever. Thirty years later, Dr. Carlos Finlay of Havana again urged the connection between mosquito and yellow fever, but, although he attempted numerous experiments, he failed to transmit the disease because, after feeding Aedes mosquitoes on yellow-fever patients, he made them puncture non-immune

persons one or at most five days later. This period is now known to be too short, since mosquitoes do not become infective until ten or twelve days after feeding on a yellow-fever patient, who, on the other hand, is said to become non-infective after the first three days of illness.

No doubt the yellow-fever parasite, like the malaria germ and the trypanosome of sleeping sickness, perforce must undergo some stage of development within the body of its specific carrier. Until the other day we did not know the yellow fever germ, not that candidates for that distinction were scarce, for their number was legion. Fungi and bacteria did not seem to account for all the peculiarities of the disease; a protozoal organism was indicated, minute, ultramicroscopic in at least some of its stages, and one capable of passing through a Berkefeld or Chamberland filter.

Schaudinn in 1904 suggested a spirochæte (*Spiro schaudinnia*), and two years later Stimpson discovered spirochætes in the kidney of a yellow-fever victim. At the meeting of the American Association for the Advancement of Science in New Orleans, Dr. Calkins said:—

"A single genus of protozoa is known at the present that fulfils all the conditions of the yellow-fever organism; amongst its species are some that are at times ultramicroscopic, that have a characteristic change of hosts from warm-blooded forms to mosquitoes, and that are characterized by remarkable virulence. This is the genus Spirochæte, and in it alone at the present time do we find the type that satisfies all the conditions known of the organism of yellow fever."

Now the Japanese physician Noguchi, working on the Rockefeller Commission, seems to have proved that a Spiroschaudinnia is the parasite of yellow fever.

Our demonstration of the mosquito theory of malaria was child's play. The demonstration of the mosquito theory of yellow fever was a matter of life and death. The officers composing the American Commission were: Dr. Walter Reed, Dr. James Carroll, and Dr. Jesse Lazear, all non-immunes, that is to say men who had never been protected by previous attacks of the disease, and also Dr. Aristide Agramonte, a Cuban immune. All honour to these men!

Here we must appreciate thoroughly the deadliness of the disease and the opinion then universally accepted that it was spread by fomites, that is to say, by the infection of places and of articles of bedding, clothing and furniture.

In order to exclude these possible sources of infection and test the mosquito hypothesis two small buildings were constructed, known respectively as the "infected clothing building" and the "infected mosquito building."

The infected clothing building, 14 ft. by 20 ft. in size, was constructed to exclude efficient ventilation, and was provided with wire screen windows and double wire screen doors to keep out mosquitoes. Into this building were brought three large boxes filled with sheets, pillow-slips, blankets, and other clothing, fouled by contact with yellow-fever cases and their discharges, many of the articles being soiled with black vomit.

On November 30 three non-immunes, Dr. Robert Cooke, Acting Assistant Surgeon, U.S.A., and two privates of the Hospital Corps deliberately unpacked these foul articles, which had been packed two weeks previously, and gave each a thorough handling and shaking to disseminate through the air of the room the supposed specific agent of the disease. They then used them in making up the beds in which they were to sleep for twenty consecutive nights. This revolting experiment was thrice made and heroically endured, the volunteers even sleeping in the soiled garments of yellow-fever victims. Not in a single case was there a symptom of disease. Thus the old theory of the spread of yellow fever by fomites was demolished.

The infected mosquito building, equal in size to its companion, was its antithesis as far as other features were concerned. It was constructed to give the best possible ventilation, and the required bedding was brought into it thoroughly sterilized. Like the infected clothing building it was screened carefully, but in this case it was to keep experimentally-infected mosquitoes in, as well as to keep other mosquitoes out. Through the middle of the room ran a permanent wire screen partition.

The first experiment with infected mosquitoes began on December 5, 1900. A young private from Ohio, named John Kissinger, volunteered, "solely in the interest of humanity and the cause of science"—these were his own words—and he was followed by another young private named John Moran, also from Ohio. Reed explained the possible danger and suffering involved in the experiment, then, seeing these men were determined, he stated that a definite money compensation would be made them. Both declined to accept, making it, indeed, a stipulation that they should receive no pecuniary reward, whereupon Reed said: "Gentlemen, I salute you."

Three and a half days after having submitted to the stabs of five infected mosquitoes Private Kissinger developed unmistakable yellow fever. Fortunately he recovered.

Twelve non-immunes, who had been carefully protected in camp for at least fifteen days from every possible source of infection, were exposed to the bites of mosquitoes previously fed on yellow-fever patients. Of the men so bitten, ten developed the disease within the normal incubation period—three to five days. Throughout the experiment other non-immunes slept in the little building separated from the patient and protected from infected mosquitoes by the mosquito-proof partition these suffered no ill-effects.

These experiments, together with their subsequent and repeated practical application, proved that yellow fever, like malaria, is transmitted by a mosquito (*Aedes calopus*), and cannot, under normal conditions, be contracted in any other way.

Never let us forget the gallant little band of

medical investigators, Reed, Lazear and Carroll, who gave us this all-important knowledge.

Carroll was the first to submit to the bite of infected mosquitoes, on July 27, before the more carefully planned experiments began. Taken ill on August 31, his life was in the balance for three days.

Lazear was bitten accidentally on August 31 while handling infected mosquitoes, was stricken and died in convulsions just one week later, after several days of delirium with black vomit. "I shall never forget," says Carroll, who was then recovering from his own attack of yellow fever, "I shall never forget the alarm in his eyes when I last saw him alive in the third or fourth day of his illness. The spasmodic contractions of his diaphragm indicated that black vomit was impending, and he realized their significance." Four days later he died, leaving a widow and two little children, the younger of whom he had never seen.

Reed died of appendicitis November 22, 1902. Worn out by his labours, suffering, as many who have achieved distinction have suffered, from the injustice of those to whom he naturally looked for appreciation of his work, he died disappointed and impecunious. Just before he was operated on he said to his old friend, Major Kean: "Kean, I am not afraid of the knife, but if anything should happen to me, I am leaving my wife and daughter so little," and as he went under the ether he was heard to whisper "So little, so little." For the honour of humanity I am glad to say that those he loved have been protected.

Turn now to the practical application of the information supplied by these brave men. I need not rehearse the twice-told tale of the cleansing of Havana, it is better known than the cleansing of the stables of Augeas by Heracles. Nor need I tell you how the mighty sanitation system of the United States crushed the Panama Hydra and made a sanatorium of the most unhealthy spot in the world. In 1913, invited by Surgeon-General Gorgas, I had the opportunity of visiting the Panama Canal Zone. Thus was I able to witness the greatest engineering feat of our age and the noblest triumph of tropical medicine on the very day the Pacific waters rushed to meet those of the Atlantic, after æons of separation. But it was mournful, then, to see the scattered wreckage of the French machinery, a monument to disaster, and to think that De Lesseps, the famous builder of the Suez Canal, had played a losing game with "Yellow Jack," sacrificing uselessly millions of money and thousands of lives, when, already in 1854, another great Frenchman, Louis Beauperthuy, had warned us of the part played by the mosquito in the transmission of yellow fever.

Surgeon-General Gorgas succeeded not only in eliminating yellow fever, malaria and other diseases from the Panama Canal Zone, but also in proving that the white man can live and prosper within the great Tropical Belt, for, as I ventured to assert twenty-three years ago, it is parasitism, not climate, that opposes colonization. At that time my views were received adversely by most physicians, and one, who boasted of wide tropical experience, concluded a letter to the *British Medical Journal* by saying: "Without entering further into detail, I contend that the views of Dr. Sambon are unsound, that his conclusions are fallacious, and that the practical acceptance of his doctrines would materially increase the already too great sacrifices of human life in the tropics."

These views, I am glad to say, proved dangerous only to myself. However, I obtained the support of a few far-seeing men like Sir Harry Johnston, Sir Patrick Manson, Sir James Cantlie, Professor Blanchard and Professor Rho.

On March 23, 1914, Surgeon-General Gorgas came to London, and, in an address delivered at the Royal Society of Medicine, said:—

"The appearance of Americans on the Isthmus is the best evidence as to their health. They are vigorous, well-nourished, and healthy. They look more like a farming population from the Dakotas than an aggregation of artisans and mechanics. This is an instance of an Anglo-Saxon population consisting of 10,000 men, women and children, being brought directly from the temperate zone to one of the most unhealthy locations in all the tropical world. Yet at the end of ten years there has not been the least impairment of health. The health rates are exceptionally good. All that has been done at Panama is to protect from the infectious diseases, principally malaria and yellow fever. This is evidence that it is the infections, not the climatic conditions, that have heretofore caused the wilting of the white man in the tropics. Protect him from infection and he will thrive, no matter what exposure he has to climatic conditions. Our white men at Panama work out in the open, exposed to sun, rain and wind, day in and day out, month after month, and year after year. What has been accomplished at Panama can be accomplished anywhere else in the tropics. The expense is not large, nor the labour great."

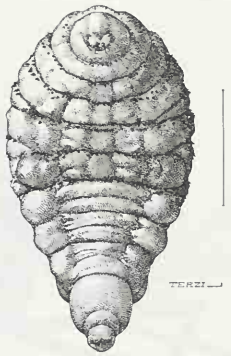
So my views were not unsound, conclusions not fallacious, nor doctrines dangerous. To me the brazen Colossus of Rhodes shrinks into a pigmy by the side of the living Colossus of Panama, as I see the amiable American General standing astride the great ditch.[1]

I have mentioned the three most important diseases, malaria, yellow fever, filariasis, known to be transmitted by mosquitoes, but there are more, as, for instance, dengue or "break-bone fever," known also as "dandy fever" in India, "date fever" in Egypt, "polka fever" in Brazil, and the "fever of sighs" in the Hawaiian Islands. Closely related to yellow fever, it is characterized likewise by a double febrile paroxysm, is conveyed by the same mosquito (*Aedes calopus*), and, no doubt, is

[1] Surgeon-General Gorgas died on July 3 in the Queen Alexandra Hospital at Millbank, where he was visited by the King, who conferred on him the K.C.M.G.—Edd. "United Empire."

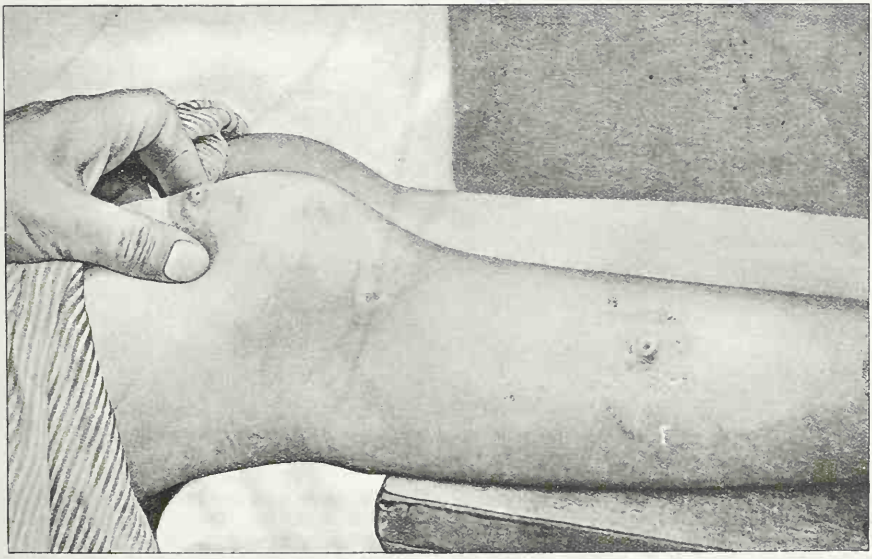
caused also by a Spiroschaudinia. It differs greatly, however, in its benignity, therefore, in spite of the severe sufferings it entails, the Spaniards call it the "merciful fever."

One other mosquito-borne disease I must mention: a maggot-disease of man, similar to the warble disease of our cattle. I have seen it in Trinidad, in Colombia, in British Guiana. It ranges throughout a vast area in Central and South America, and is due to a hateful fly with yellow face, prussian-blue abdomen, and field-grey thorax, called *Dermatobia hominis*. Its young develop in warbles beneath the skin of man and animals, such as the brown howler, capuchin monkey, puma, agoutis, ox, goat, hog, toucan and turkey. Men working in the mahogany forests of Honduras and Colombia are liable to heavy infestation (as many as a hundred maggots have been found riddling the skin of a single patient), yet no one has ever seen the mother-fly approach man either by day or night. The noxious grub is known to the natives by the name of "mosquito worm," and is believed to be deposited by a large mosquito that inserts the grub in the wound it makes with its piercing, blood-drawing instruments. This belief is so old that it is mentioned by the Jesuit father, Bernabé Cobo, in 1653, and De La Condamine in 1745. Armchair scientists, however, laughed at the native's "ignorance" and mocked the travellers' credulity, even as they had ridiculed the Texas farmer for believing that ticks give rise to redwater fever in cattle, and Herodotus and Aristotle for mentioning the crocodile's guardian-bird (*Pluvianus ægyptius*), the pinna's crab-lodger (*Pinnotheres*), and other curious animal associations now fully established.



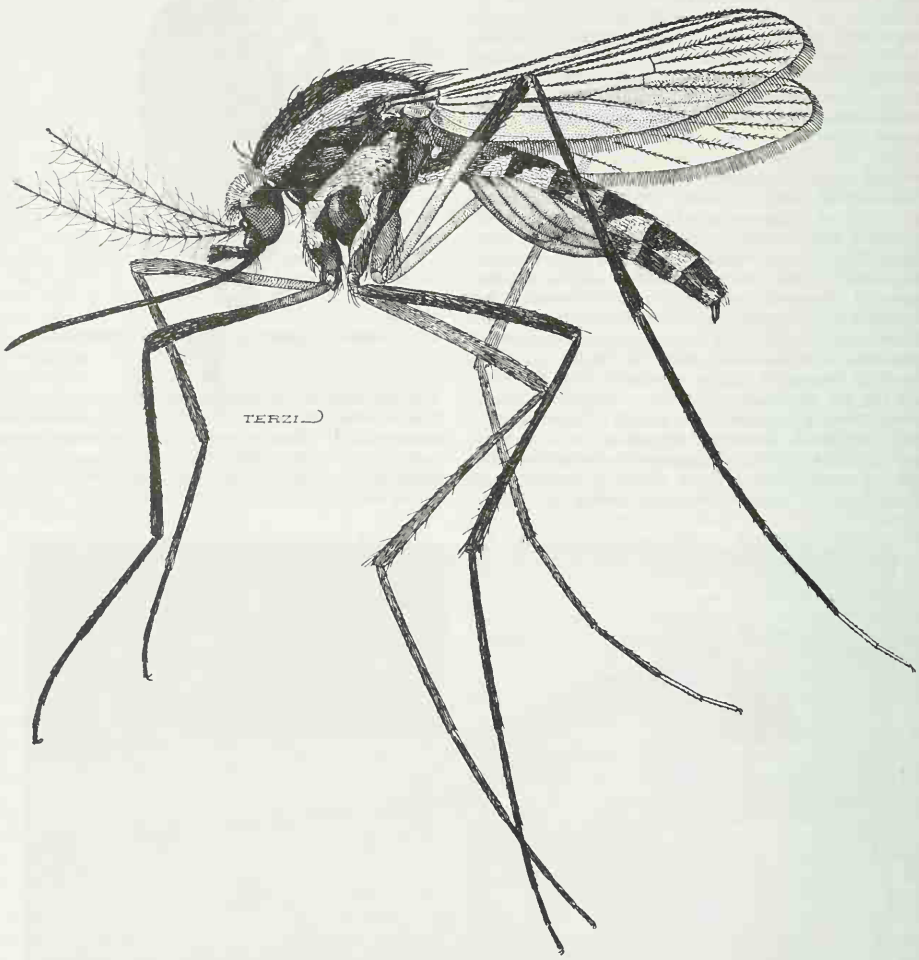
Larva of *Dermatobia hominis* from knee of man (Trinidad, West Indies).

In the case of dermatobia the natives were right. This is what happens. The female fly visits some forest pool or other mosquito breeding-water there to lie in wait for a mosquito, preferably a janthinosoma, just out of its pupa case. Here is one standing on its cast-off skin, as on a bark-canoe, unfurling



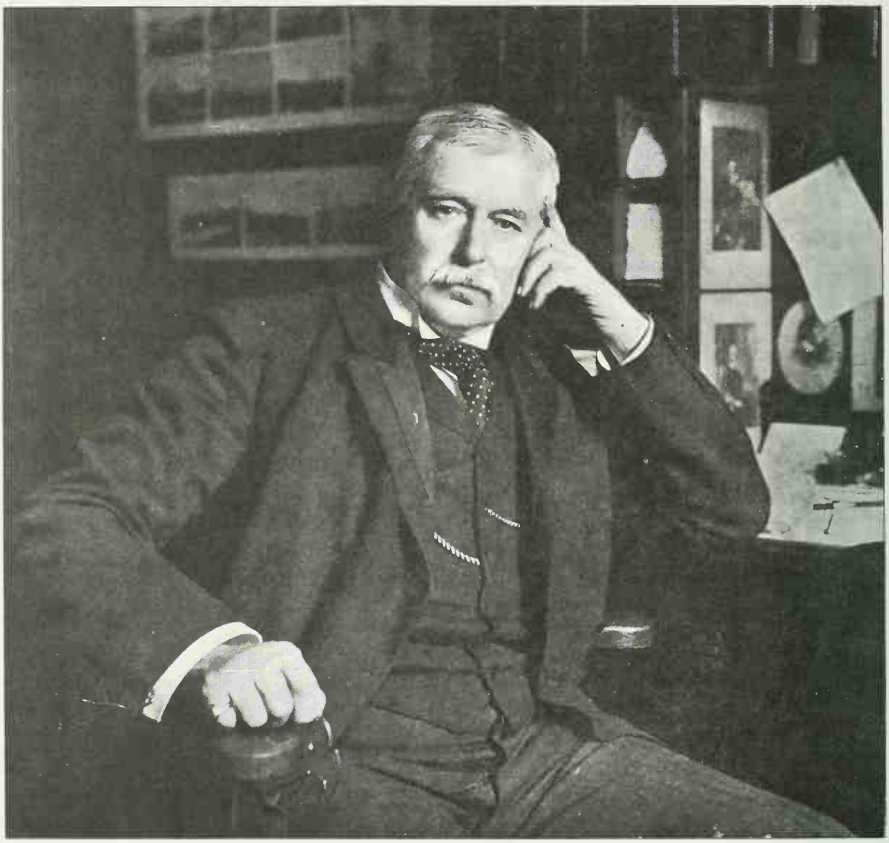
Lower limb of woman with dermatobia "warbles" above knee and on leg.

two large wings of rainbow-gauze and resting its forelegs on the water like a pair of oars. See, it has left its tiny craft and now is resting on the surface of the water as securely as the familiar pond-skater or water-strider. What a beautiful creature! It slender, elegant frame flashing violet, murrey, and sky-blue scintillations in the warm, bright sun. Presently it will take wing and join its companions in their mazy nuptial dance. But suddenly the watching dermatobia pounces upon it, and now

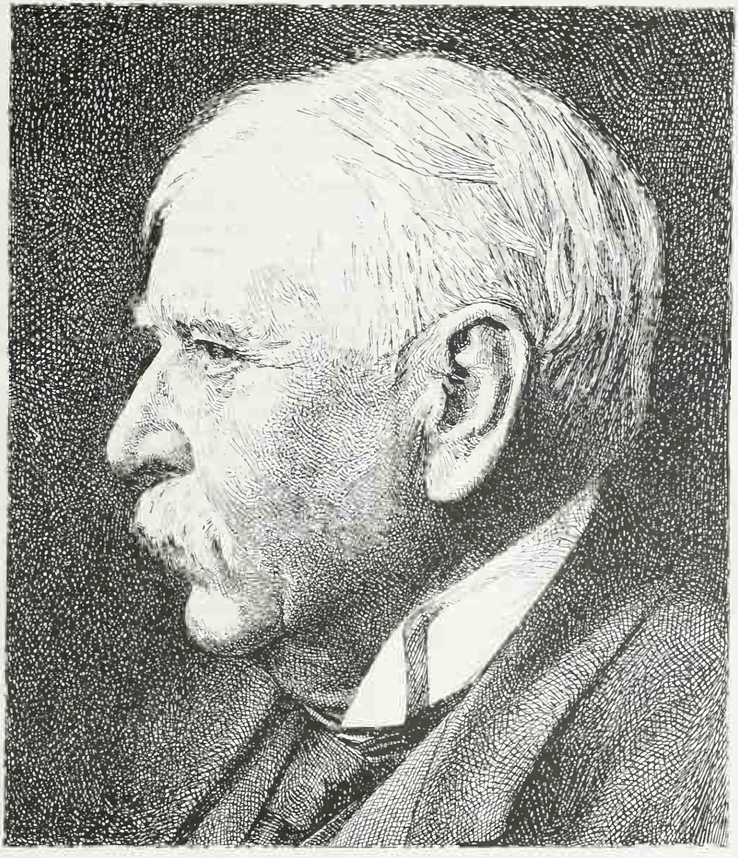


Janthinosoma lutzi, bearing, attached to ventral surface of abdomen, cluster of dermatobia eggs.
(Specimen in Wellcome's Bureau of Scientific Research.)

is a female janthinosoma, called *Janthinosoma lutzi* after a Brazilian scientist, to whom we owe a great debt of gratitude for his many important contributions to science. Look at it, holding up first one leg, then another, the scales that bedeck its holds it firmly with her legs. See how swiftly she deposits eight, ten, twelve, eighteen long, pale yellow eggs, glueing them one by one to the ventral surface of the gnat's first two or three abdominal segments, until they form a close bundle, like a



SIR PATRICK MANSON,
G.C.M.G., K.C.M.G., F.R.S., M.D., LL.D.(ABERD.), F.R.C.P.(LOND.),
IN HIS LABORATORY



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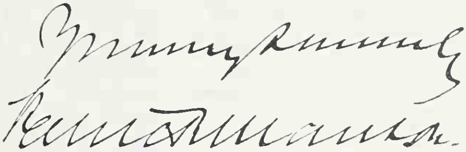
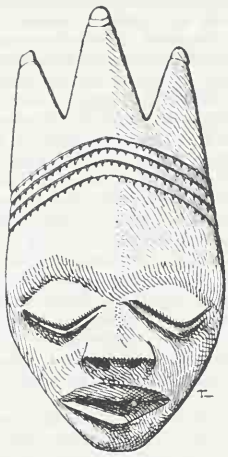


miniature cluster of bananas. Now she releases the affrighted culicid, leaving it to fly off like a fighting aeroplane laden with bombs. The eggs contain fully developed larvæ, ready to hatch, some of them indeed have already uncapped their egg-shells and are looking out ready to drop on the first suitable host upon which their jinn-like carrier may happen to alight. As soon as the mosquito has settled and bitten, the larvæ leave their egg-shells, and, creeping to the wound enter it immediately on withdrawal of the phlebotomist's instruments. Thus does the mosquito not only distribute the dermatobia larvæ, but opens for them a passage through the tough skin of the host, in whose body they will develop.

Man is said to have used the aeroplane in Grecian days, and legend ascribes to Daedalus the invention of artificial wings, but, granting this, he was forestalled by the animals. Nor is dermatobia the only insect that uses an aeroplane in its wingless stage. The common house-fly is often used as a flying machine by *Chernes nodosus*, one of the chelifers or book-scorpions, which clings to its legs simply to be carried from place to place. Even higher animals are believed to avail themselves of flying machines for many small birds, incapable of long flight, are said to have been seen travelling on the backs of migrating cranes.

The story of dermatobia is wonderful, but not more so than that of a thousand-and-one other of strange parasites more changeable in form than the "Old Man of the Sea," and whose ordinary mounts are rats, birds, lizards, fishes, fresh-water crabs, pond-snails, ticks, lice, flies and fleas—true elfs and goblins whose life-histories make more wonderful tales than any told in the nurseries of ancient Athens, Yedo, Bagdad, or Trondhjem.

One can never tire of these stories from Nature's endless chap book. I should like to tell you some of those I know best. For instance, the story of the Sleeping Sickness. How the sufferer was led into the jungle and there left to the mercy of leopards, vultures and laughing hyænas. How slave-dealers recognized the disease in its earliest stage by palpation of the enlarged cervical glands and threw the useless cargo overboard to the sharks. How Nepveu in Algeria, in 1890, and Forde in the Gambia, in 1901, discovered trypanosomes in the blood of man associated with hitherto unrecognized febrile conditions. How Castellani in Uganda, in 1902, found these organisms in the cerebro-spinal fluid of sleeping-sickness patients and came to the conclusion that they were the cause of the disease, a relation subsequently experimentally proved by Sir David Bruce, Dr. Nabarro, and others. How here, in London, I puzzled out the œcology of the disease and, simultaneously with Brumpt, who was working in the Congo, first pointed out that the transmitting agent must be a tsetse-fly. How, differing from Brumpt, I incriminated the Dusky Tsetse Fly (*Glossina palpalis*), the range of which covered the spread of the disease and maintained that the morphologically differentiated parasites, seen in human blood, represented sexual forms and must, like malaria gametes, go through a stage of conjugation and multiplication within the body of the fly, a stage which, I maintained, was suggested by Bruce's own experiments (Zululand, 1896) on the Nagana trypanosomiasis, if correctly interpreted. How, after nine years, my views were justified by Kline's careful researches. How Congo natives endeavoured to ward off the disease by wearing amulets carved out of elephant or hippopotamus ivory in the shape of masks showing the characteristic puffy, drooping eyelids almost entirely covering the eyes, or of small seated figures with both hands pressed upon the aching forehead. How modern specific sanitation is about to break the spell of the fearful sleeping sickness ere it cause greater havoc in Africa, and, indeed, may not the extinction of horses and camels in America—their ancestral



Sleeping sickness amulet.

home—have been due to tsetse-borne trypanosomiasis? Tsetse-flies are confined now to Africa, but two fossil species have been found in the miocene of North America.

Many are the stories of rat-borne diseases, such as trichinosis, septic-pneumonia, epidemic jaundice, rat-bite fever, and bubonic plague, which I have no time to tell. However, as Government has decided at last to take action and has ordered the extermination of rats by ferret, terrier, trap, poison, and virus, I beg to be allowed to say a few words on the subject.

From recent official publications I notice that naturalists continue to perpetuate the erroneous notion that the Black Rat (*Rattus rattus*) was unknown to the ancient Greeks and Romans, and that it came to Europe in the ships of returning

crusaders. More than twenty years ago I endeavoured to show that the rat (*Rattus*) has inhabited Europe from time immemorial; that to the ancients the rat was merely a large mouse, and, indeed, the early mediæval bestiaries describe and picture a *Mus major* (rat) and a *Mus minor* (mouse). I drew attention to the innumerable representations of murids in ancient Greek, Etruscan and Roman art, and especially to works portraying them in actions more appropriate to rat than mouse, such as gnawing ship cordage, as on Etruscan bronze votive boats, feeding on mussel-beds, as on Cuman coins, spreading the bubonic plague, as on Roman colonial coins. I laid particular stress on the raging of plague in Rome, three centuries before our era, because, in the light of modern knowledge, it clearly reveals the presence of the rat. Outside the permanent Asiatic plague-area in which the Bobak marmot stands as reservoir, plague and rat are inseparable. The trespass offering of five golden "mice" (rats) and of five golden emerods (buboes) presented by the plague-stricken Philistines in returning the ark are evidence of the antiquity of the knowledge which connects the rat with plague. Many bronze and terra-cotta votive offerings in the shape of buboes and rats have been found recently in Palestine, the Troad, and Italy. Strabo, in his geography, written some years before our era, says that in *Iberia* (Spain) rats frequently give rise to pestilence, and that the Romans issued a proclamation offering bounties for the destruction of rats in one of these plague-outbreaks in Cantabria. A colonial coin of the Emperor Lucius Verus, struck at Pergamum during a plague epidemic, bears on the reverse a figure of Æsculapius with a rat at his feet, whilst on his right stands the naked figure of a man in an attitude of fear or supplication. The Roman god of healing here replaces a local plague deity, Apollo Smintheus, the destroyer of rats, "whose arrows spread the plague." The specimen of the Pergamene plague medallion in the collection of the British Museum is pierced for wearing as an amulet, maybe for protection against plague.

As to the Brown Rat (*Rattus norvegicus*) a similar error survives. Naturalists still assert that it did not reach Europe before the eighteenth century, and give figures purporting to be the exact dates of the first arrival of brown rats in different countries—Prussia, 1750; Norway, 1762; Faroe Islands, 1768; Sweden, 1790; Switzerland, 1809—as if they had actually viséd the passports. We know from Pallas that in 1727—a "mouse year" in the Caspian region—vast hordes crossed the Volga and swarmed into Astrakan, hence spreading westward across Russia; but this fact does not prove that the brown rat then first migrated into Europe. Ælian, in his work "De Natura Animalium," written in the second century A.D., undoubtedly refers to the brown rat when he says that "Caspian rats" at times migrate in countless hosts and bridge the rivers, forming live rafts, each rat holding by teeth to the tail of the rat in front.

I have little faith in the success of a general crusade against the rat. Experience has shown again and again that rat extermination is practically impossible. It may have been otherwise at the time when, according to that distinguished Spanish canonist, Azpilcueta of Navarre, rats exorcised and ordered to depart for foreign countries would obediently march to the coast in large bodies and thence swim off in search of desert islands where they could enjoy life without annoyance to man. Unfortunately, rats can no longer be exorcised or rhymed out of existence. In India rats are as plentiful as ever, notwithstanding the enormous destruction carried out since plague broke out. No better results were obtained in Japan, where the campaign was carried out with a thoroughness characteristic of the Nippon Islanders. The slaughter only renders conditions more favourable for the multiplication of the survivors. The increased mortality is met by an increased birth-rate, and, as everyone knows, the rat's breeding powers are incredible. Five to ten litters in a year, six to twenty young in a litter, and the young able to breed in less than three months! Besides, what would be the use of destroying rats unless we made adequate provision to prevent more rats from landing? Every ship brings rats, especially grain ships, a thousand and even 1,700 rat carcases have been counted after fumigation of a single ship, and thousands upon thousands of ships reach our ports. What we can and should do is carefully to preserve the natural enemies of the rat and to render our wharves, quays, markets, store-houses and other public buildings rat-proof. The rat must be entirely excluded from occupied buildings. He must be de-domesticated, if I may use the expression, he must be built out of existence—as Surgeon-General Blue tersely puts it. Attracted by food and cover, he has overcome every fear of man and imposed himself upon us as an effronted and dangerous commensal. The proper storage of food, the immediate removal and burning of all food-wastes, garbage, and rubbish, the destruction of places in which he may find harbourage, and the contrivance of architectural modifications apt to cut off his approach, the liberal use of concrete, wire netting, and sheet metal will certainly discourage him.

Modern sanitation need not be unnecessarily sanguinary. Hygeia is no Moloch. I do not hold with those who would exterminate the entire African fauna to stamp out the tsetse-borne sleeping sickness. Many species have died out gradually without a struggle owing to changes in their environment. A change in the construction of roofs has banished the swifts which used to build their nests beneath the old projecting eaves. Amongst disease-carrying species, I might instance that engineering changes in large seaports of the Atlantic coast of the United States, by abolishing the breeding pools of the Ædes mosquito, have prevented the recurrence of those fearful epidemics of yellow fever which used to be so frequent in the latter part of the eighteenth century and the beginning

of the nineteenth, long before anyone suspected the mosquito to be the carrier of the deadly disease. So also the iron bedstead replacing the old wooden one is tending to banish the bed-bug and with it relapsing fever, typhus, plague, probably tuberculosis and other diseases in the transmission of which it aided the louse and the flea.

The agency of the rat in the dissemination of plague, the constant association of plague epidemic with plague epizootic, the part played by certain insects, especially fleas, in the transmission of the disease are things but of yesterday to the modern sanitarian. The Ancients, however, knew them and, what is more, knew how to control the disease. Probably you have heard how, with young lemon-trees from Australia, a white scale-insect, the cottony cushion-scale (*Icerya purchasi*), was introduced into California. This pest attacked orange-trees and soon became a menace to one of the most important food industries of California. Some orchards were infested so heavily that the trees seemed covered with snow. The orange-growers, alarmed, appealed to the United States Department of Agriculture. An expert, Mr. A. Koebele, was sent to Australia to find out why the Australian scale, so destructive to Californian citrus-plants, was harmless in its native land. Koebele found that there it was kept in check by a brilliant red ladybird (*Vedalia cardinalis*), and so introduced this insect into California. As soon as liberated in infested American orchards, the vedalia made short work of the cottony cushion-scale. But its mission performed, it began to die out. Then it was discovered that it fed only on cottony cushion-scales and was perishing for want of food. Therefore now in California a stock of the scale is kept to breek vedalias that they may be always at hand ready to liberate in any infested orchard. This is exactly what the Ancients did in the case of plague. They carefully protected and, when possible, domesticated the natural enemies of the rat, even deifying some of the more useful ones such as the cat, the kestrel and the cobra, while they made special use of rat-eating species of snakes. They kept great numbers of these harmless snakes in specially constructed pits in their medical temples, sending them to be liberated wherever the disease had broken out. Thus we know how in the year 293 B.C., Rome being ravaged by the plague, the Tribune Quintus Ugulgius went to Epidaurus at the head of a commission to ask the priest-physicians of the famous Asklepion temple what should be done to check the pestilence that was devastating the city. We know that they brought back with them rat-eating snakes and that these soon put an end to the disease. After a time the snakes died out, but the people long after continued to paint their effigies on the walls of the lararium, in token of gratitude and paid them the tribute due to protecting household gods. The Ancients did not only pit the rat-eating snake against the plague-carrying rat, but they protected also the Scarab, or dungchafer, because it destroyed the Heltu-worm (*Ankylostoma*) that caused laziness, dirt-eating, and intense anæmia and the ibis, because, its usual food being fresh-water univalve molluscs (Planorbis, Melania, Bulinus, &c.), it stood on the margins of the Egyptian irrigation canals and kept at bay the "winged-snakes," two formidable snail-fostered parasites of man: *Schistosoma hæmatobium*, which gives rise to endemic hæmaturia, and *S. mansoni*, which causes a form of dysentery. They even pitted the pus-forming coccus against the pest-bacillus and the kine-pox germ against human small-pox. Indeed, three thousand years before Jenner, the Hindus fought the small-pox by inoculating lymph from the pustules of the zebu calf. Wonderful were those Ancients who disabled the viper, the cobra, and the rattlesnake with the very venom of their striking fangs, who inoculated the oriental sore to prevent greater mischief, who defeated their more insidious parasitic foes by boiling the water and cooking the foods in which they ambushed, and who kindled "need fires" to ward off pstilence, murrain, and crop disease. But then, like Mowgli, they lived with the beasts of the jungle and the birds of the air. They hunted with the dog, the cheetah, the eagle and the falcon; they fished with the otter, the cormorant and the sucking-fish. They sent their messages of love and war on the wing of the carrier-pigeon and, lest a bird of prey should kill the homing dove, they attached shrill reed-whistles to her remiges and tail-feathers, so that strange sounds during flight should disconcert the pursuer and stay his talons. We, polyps of the brick town, are no longer in touch with Nature. No one to-day would dare compare our statuary with the noble works of Phidias, Praxiteles, and Lysippus. The philosophy, the literature, the architecture, the agriculture of the Ancients have never been surpassed. Believe me, in sanitation, in preventive medicine, the Ancients were likewise our superiors. Consider the stately Roman aqueducts of stone, brick, or concrete (pisé), the gigantic Punic cisterns,. the mighty Etruscan sewers still in use, the prohibition of certain foods, the laws regulating sexual intercourse, the quilted caparisons and many-tasselled trappings for horses in tsetse regions, the litham or face-covering of the Tuaregs, the use of wormwood oil and the night smudges to repel blood-sucking insects, and you will admit this. Modern nations undertaking colonization should copy the great colonists of the classic period, whose success in planting large, prosperous colonies was due to the fact that their first step invariably was to banish disease by means of thorough sanitation.

What have we done?

In 1913 I visited the West Indies—the "Isles of the Blest," as they were called—and ever since I have longed to return. I went there on behalf of the Colonial Office to investigate pellagra, a disease the recent recognition of which in Jamaica, Barbados, and Antigua had caused some alarm. I found it present in all the islands of the Leeward

group I was able to visit. It differed in no way from the classic form I had seen in Spain, Italy, France, Austria, Hungary, Roumania, Britain, and the United States of America. In some of the islands I found sanitation much neglected and preventive measures ignored, but in making this statement I feel in justice bound to state that nowhere in the West Indies have I met with conditions so deplorable as in certain parts of Europe and especially in many of our rural districts at home. However, it was painful to find such diseases as elephantiasis, ankylostomiasis, yaws

Case of elephantiasis in Hindu girl under the care of Dr. Ozzard, George Town (British Guiana). (Photograph by Dr. Sambon.)

and leprosy rampant. Elephantiasis in young subjects is unpardonable, because this disease, mainly or entirely due to filariasis, is preventable. This was demonstrated no less than forty-two years ago by Manson in China. The discovery that filariasis is a mosquito-borne disease soon became the corner-stone of modern biological medicine.

With regard to ankylostomiasis, I regretted to find that we were letting Americans cleanse our Augean stables. At Government House, in Barbados, I met Mr. Wickliffe Rose, the capable Administrative Secretary of the Rockefeller Foundation and heard him lecture on the subject. He told us how they had been spending labour and money in Cuba, Porto Rico, and the Southern United States to stamp out the fell disease that was sapping the life of their people; he told us how the wrecking of their work was threatened by importations of infected labourers from the British West Indies, and how, seeing that we were not likely to take any step in the matter, they had decided to offer to do it themselves at their own expense, because, even then they found it financially advantageous. These were not his actual words—indeed, he was a master in courtesy; but that was the purport of his message and, whilst admiring the practical, far-seeing people the speaker represented, I felt shame at our neglect and supineness. I remembered the case of the Spanish physician who, in 1905, before the Madrid Royal Academy of Medicine, lamented, not the loss of Cuba and Porto Rico, but that, in less than two years, the Americans had been able to eliminate yellow fever and ankylostomiasis, whilst Spaniards, during their long domination since the days of Columbus had done nothing for the health of these islands. The next day, driving by Gun Hill, I saw Wilkinson's lion cut out of the coral limestone with head turned seaward, watching over a mighty battlefield, the ocean; it reminded me of the Greek sentinel lion overlooking the famous plain of Chæronea, but I wondered what had become of British pride and sense of duty. All they could show me concerning the control of ankylostomiasis was one of the old tin masks that were cruelly placed on the face of the poor anæmic slaves whom hookworm had turned into "dirt-eaters."

And leprosy. Is it not a shame that we should still be ignorant of its natural history and unable either to cure it or prevent it? The leper in his repulsiveness is still calling out "Unclean, unclean"—for us to avoid him; he is still being buried alive in out-of-the-way asylums, where he dies more slowly than the Hindu leper women who, in ignorant superstition, allowed and even craved that they should be buried alive to ensure their children's immunity.

Linnæus shared the popular belief of the Northern people as to the insect-transmission of leprosy, and, so far as I can judge, from the few observations I was able to make during my hasty voyage, I believe the medium of infection should be looked for among Culicoides and other such midges of cosmopolitan range, but discontinuous distribution limited to peculiar scattered areas. There should be no real difficulty in arriving at a knowledge of the natural history of leprosy; all we need is to work at it. Take sleeping sickness. It had baffled investigation for over a century; then, suddenly, in less than three months, it was elucidated thoroughly.

Returning from the West Indies, impressed by all I had seen, I suggested that the Lesser Antilles

be chosen to carry out a thorough medical survey that might enable us to study the œcology of tropical diseases and possibly elucidate many points still obscure in their natural history—one point being the nature of blackwater fever, still by many considered a "severe form of malaria," notwithstanding its far greater affinities with the hæmoglobinuric fevers of cattle and other animals. The reason for selecting these islands is not the greater prevalence of tropical diseases but the reverse—their far greater healthiness compared with other tropical countries. They offer ideal conditions for the investigations I propose. In the first place they are small, and that is a great advantage. You know that the phenomena of glaciation have been

Case of nodular leprosy in West-Indian Negro under the care of Dr. Macdonald, Antigua (British West Indies).

studied chiefly on the small Swiss glaciers because they were easily attainable and conveniently placed in the centre of the scientific world. Volcanic phenomena likewise have, for the same reason, been studied chiefly on Vesuvius, Etna, Tschia and the Lipari islands; so tropical diseases are best studied in small tropical islands—some of them, indeed, being true laboratories. Moreover, the Lesser Antilles offer great diversity of physical structure, geological formation, flora, fauna, human inhabitants, diseases of man, animals and crops. Some are still clothed in primitive forest, others are cultivated to yield a single crop. Such diversity, together with the lesser complexity of œcological conditions in small areas, greatly favours the elimination of negative factors and the discovery of those which are causative or otherwise important in determining the presence, activity, or quiescence of any disease. Further, I have suggested that one of the islands, preferably Barbados (already free from malaria and yaws) should be freed forthwith from elephantiasis and ankylostomiasis, also possibly pellagra and leprosy. With regard to elephantiasis, once called "the Barbados leg," there should be no difficulty and I trust that Sir Patrick Manson, to whom we owe practically all our knowledge on filariasis, will himself direct the work I have suggested, and write *finis* to this great chapter in tropical medicine.

A powerful Committee is now being formed to carry out this work, and, with adequate support, all the knowledge collected during long years of colonial administration will be crystallized at last into practical results.

ACCLIMATIZATION AND SUNSTROKE.

By G. Giglioli, M.D.(Pisa), D.T.M. and H. (London).

Up to the very last years of the past century the majority of tropical diseases, well known to us to-day in their ætiology, were ascribed to the direct and deleterious action of high temperature on the system, consequently the acclimatization of the white man in the tropics was considered impossible. Under these adverse climatic circumstances he was condemned inevitably to degenerate and die out.

In 1897 Dr. Sambon, in the *British Medical Journal*, with a masterly and fully documented article, attacked these old and, at the time, almost dogmatic tenets, and pointed out that it was disease, not climate, that killed the settler and opposed tropical colonization. He held that the diseases of tropical countries were not due to meteorological conditions, as erroneously and generally believed, but to parasites, which found within the tropics the conditions most favourable to their life and development. Consequently, he argued, specific sanitation, based on a definite knowledge of the various causative factors in the ætiology of tropical disease, should enable the white man to live within the tropical belt as safely and healthily as elsewhere.

It is needless to say that, at the time in which this article was written, tropical medicine was in its infancy; the great malaria mystery was only just beginning to unfold itself and the many and wonderful romances of the life-history of the numerous deadly parasites, with which the student of to-day is familiar, were at that time completely unknown. Yet such was the foresight and penetration with which it was written twenty-five years ago, guided and inspired solely by the great laws of epidemiology, that to the reader of to-day, familiar with the great modern conquests of tropical medicine, the revolutionary concepts flung out by Sambon seem quite

natural and little more than common sense. Not so in 1897.

However, a small number of scientists (Manson, Cantlie, Stanley, Johnston in England, Blanchard in France, Rho in Italy and a few others) welcomed the new theories with enthusiasm. Sir Patrick Manson directed attention to Sambon's paper by writing a powerful leader in the same issue of the *British Medical Journal*, pointing out its immense economic and practical importance and, after carefully analysing and examining the new theory, he emphasized Sambon's contention that disease germs are as much members of the fauna and flora of a country as are the other living things in it. "Get rid of," he says, "or avoid these germs, and we are rid of a principal obstacle to the colonization of the tropics by Europeans. To do this all that is necessary is knowledge and properly directed effort—that is, an active and intelligent hygiene, one such as advancing civilization and science are evolving." His leader concludes with some reservations. "To this extent," says he, "we thoroughly agree with Dr. Sambon. But given a clear sweep to all disease germs, there still remains the Europeans' incapacity for tilling the ground in the presence of great solar heat."

But already in his article Dr. Sambon had delineated a new theory on the ætiology of "heat-stroke." Heat, *per se*, was not capable of causing disease, and at least one of the clinical signs of "sun-stroke," known as heat-stroke, thermic fever, ardent fever, siriasis, heat-apoplexy, and other more or less appropriate names, exhibited the epidemiological features of a microbic disease. These views he elaborated and defined, perhaps with some excess, in an article published in 1898. In order to avoid other names with too obvious an ætiological significance, Dr. Sambon adopted the ancient Roman appellation of Siriasis. He gave a complete description of the disease, demonstrating how constant and characteristic it is, both in symptoms and course; he emphasized the differentiation from heat exhaustion, which he ætiologically considered a very different condition.

Heat alone is incapable of giving the symptomatology of siriasis; on the other hand, in many febrile affections, when the body temperature rises to 106-107° F. and over, no signs of "heat-hyperpyrexia" make their appearance. Having examined carefully the distribution, geographical and topographical, of the disease, its endemicity, the occurrence of epidemic-like outbreaks, the well-defined symptomatology, the occurrence of prodromata, of relapses, of sequelæ, the frequent nocturnal onset, the constant and well-defined lesions; in one word, the complex natural history of the disease, he pointed out how similar it is to that of many undoubtedly microbic affections, such as malaria, yellow fever and dengue. On these epidemiological data he based his statement that heat is not the direct cause of siriasis, but only one of the conditions necessary for the development and propagation of its, as yet, unknown micro-organism. Here again Sir Patrick Manson considered the new view very favourably, and embodied it in his great manual on Tropical Diseases, giving a new classification and comprising under the general heading of "Heat-stroke" three independent nosological entities, namely: Heat exhaustion, a simple lipotymia brought about by heat acting on a diseased organism; sun-traumatism, due to direct action of the actinic rays of the sun on the central nervous system; and siriasis. In reference to the latter and to Dr. Sambon's theory, he writes: "Time will show how far the hypothesis is correct. In my opinion it has more in its favour than any of the many theories that have been based on a purely thermic ætiology." And when in the same year, before the Royal Geographical Society, Sambon again discussed acclimatization, Manson fully endorsed the latter's views, withdrawing those reservations which he had made in his leader on Sambon's first paper in the previous year.

Professor Firket, of the University of Liege, then brought forward evidence in favour of the parasitic theory, founded on experience gotten in the Belgian Congo. Osler, in his "Principles and Practice of Medicine," judged the new theory as "one worthy of the most careful study," and mentioning a case of peripheral neuritis reported by Decrum as a sequela to siriasis, says: "This is a point in favour of the infectious nature of the disease." Dr. Gordon in "System of Medicine," by Osler and McCrae, accepts Sambon's views, as expressed in Manson's book, *in toto*.

But the most important evidence was furnished by the Boer War. During the three years over which the South African War extended no cases were recorded, though large bodies of troops endured the hardships of war under meteorological conditions apparently ideally favourable to the incidence of sunstroke.

Indian opinion on the new views of acclimatization and "sunstroke" is candidly expressed in the few lines which I take from one of the hostile articles of the time: "There appears to be a tendency amongst those of the medical profession who hail from India to treat the whole matter as a joke rather than as one meriting serious discussion. The truth is that Mr. Sambon's views regarding the acclimatization of Europeans in the tropics are so crude, and his statements so pregnant with error, that the medical profession in India is inclined to look askance at any theories propounded by him."

During the years 1904-5-6 Sir Leonard Rogers carried out a careful statistical investigation on all cases of "heat-stroke" occurring among British troops in India, noting the meteorological conditions (temperature and humidity) under which they occurred, their seasonal incidence, as well as the influence of heat waves. On the evidence of these data, Rogers came to the conclusion that heat and humidity are the sole agents of heat-stroke and, as these two factors are to a certain extent complementary, an explanation may be given of the

irregular distribution of the disease. However, he gives no satisfactory explanation as to the mechanism by means of which heat and humdiity cause such havoc in comparatively few cases, whilst thousands escape all ill consequences, though equally exposed to the very same agencies.

These Indian critics claimed that the geographical distribution described by Sambon does not apply, at least so far as India is concerned; the disease occurs far inland, in parched and arid locations and is not rare at high elevations (1,500 ft. and more). It is not prevalent along the low-lying coasts. In the valleys of the Indus and Ganges, where heat-stroke is common, the conditions differ from those of the endemic regions of malaria, dengue and yellow fever. The protective influence of acclimatization also is denied. Major Buchanan draws up some statistics to show that the disease is more common in new arrivals (through imprudence or ignorance) and again in old residents debilitated by climate and disease. But Major Buchanan has taken *ad literam* Sambon's statement as to the general prompt recovery of heat-exhaustion cases; he therefore draws the conclusion that all fatal cases should be labled "siriasis." Thus we have no doubt that his statistics include cases of sun-traumatism and heat-exhaustion, which are particularly frequent in old, debilitated residents.

One cannot help observing that, though siriasis occurs in many parts of the world, all the evidence against Sambon's views has come from India. Is this evidence really satisfactory? Many of the writers do not admit Manson's classification and attack the ætiological theory of siriasis without sufficiently considering the limited application it has in the conception of its author. In a similar way, the discrepancy anent geographical distribution appears to be largely due to a different clinical interpretation of cases. On the other hand, even if siriasis be found occasionally at high altitudes, the parallelism with other endemic diseases, such as malaria and yellow fever, is not broken, for even malaria and yellow fever have been found to be independent of elevation so long as certain mosquitoes and the necessary meteorological conditions are present.

There is no doubt that heat and humidity play an important part in the ecology of siriasis, but this does not prove that heat is the specific cause of the disease; if it were so, then we should expect some knowledge of the *modus operandi* to have been forthcoming ere now. Do heat and humidity act directly on the system and, if so, by what means, or are they merely necessary ecological conditions for the development and transmission of some micro-organism?

According to the caloric theories on siriasis, heat acts directly on the vasomotor and thermo-regulating centres; but then, why are only some few persons liable to develop hyperpyrexia when many thousands are exposed with impunity to the very same atmospheric conditions? Unable to answer this, the caloric theorists are obliged to assume a hypothetical factor which should render the body sensible to this injurious action of heat. On the other hand, Castellani and Chalmers, from their experiments in the engine-rooms of liners passing through the Red Sea, tell us that, under the exceptional conditions there prevailing, strong, healthy persons develop hyperpyrexia, while debilitated subjects were liable to syncope. The experiments of Harvey Sutton (Oxford, 1908) lead to similar conclusions. If such is the case in the tropics, in certain seasons the disease should be fairly universal. The experiments of Levene and Ira Van Giessen have demonstrated the presence of a potent toxin in the blood of siriasis patients, while the post-mortem and hæmatological alterations all point to a profound intoxication. Again, the purely toxic, or autotoxic theories, do not explain satisfactorily why only in some persons the tissues have the property of developing such potent poisons. This is the flaw in all dynamical theories, while, on the other hand, they do not agree with the known ecological features of the disease. The microbic, like all other theories, is nothing more than a hypothesis, but it has the advantage of explaining the whole complex natural history of siriasis, its pathology and morbid anatomy, without compelling us to introduce still other more or less unsupported hypotheses such as those which prop up the already tottering structure of the dynamical theory.

Moreover, it is my opinion that the evidence, which up to the present day has been adduced, can in no way claim to have refuted the microbic theory of siriasis. The experience of the Great War, that monster experiment, has made valuable contribution to this as to many other questions and problems of medicine and tropical pathology. The medical health records of thousands upon thousands of European soldiers in the tropics have proved that a high percentage of cases diagnosed and labelled sunstroke were really cases of pernicious malaria, the cerebral capillaries on examination being found crammed with the subtertian parasite. As Sambon first pointed out, these cases occurred amongst troops independently of atmospheric temperature and without direct exposure to the sun's rays. Their distribution was irregular, though constant locally. More rarely, other specific fevers were found to be responsible for the hyperpyrexia.

A paper of great interest on this subject by Captain Milner appeared in the *British Medical Journal* of July, 1918. The author had the opportunity of studying a large number of cases of "heat-stroke" during the two great heat waves that swept over Mesopotamia during the months of July and August, 1917, when the temperature rose to 125° F. The cases were treated at first symptomatically by the usual refrigerating means. Some of these cases occurred suddenly in apparently healthy subjects after exposure; others, instead, occurred in hospital in-patients suffering from other diseases, such as "sand-fly fever," dysentery, malaria, &c., and often at night. Only in the month of August the

routine examination of the blood was made in these cases when an exceedingly high percentage of subtertian infection was discovered. The routine and immediate administration of quinine was introduced with an immediate fall of the mortality from 25·6 to 11·7 per cent. Captain Miller states that in his opinion "heat-stroke as a clinical entity is non-existent; it is nothing more nor less than a symptom on a hot day of malignant tertian malaria." He believes that the toxin elaborated by the *Plasmodium falciparum* acts in these cases specifically on the thermo-regulating centres. In October of the same year, and also in the *British Medical Journal*, Colonel C. H. C. Meyer of the I.M.S., though not following Captain Milner's generalization, confirms the latter's observations with his Indian experience, and reports that already fifteen years previously Dr. A. Powell, police surgeon of Bombay, had drawn attention to the almost invariable presence of the malignant tertian parasite in cases of heat-stroke.

The theory that certain cases of so-called "sunstroke" should be looked upon as of microbic origin has now proved true, not, perhaps, that siriasis is a specific disease, as surmised by Sambon, but because again and again post-mortem findings in cases clinically diagnosed as heat-stroke have revealed the indubitable lesions and parasites of comatose pernicious malaria.

Thus Sambon, reasoning from his knowledge of the principles of disease as then known, without laboratory experiments, indicated the real nature of the various pathological conditions involved in these cases classed as sunstroke, and Manson set on this explanation the seal of his reasoned approval.

A SYNOPSIS OF THE FAMILY *LINGUATULIDÆ*.

By Louis Westenra Sambon, M.D., F.Z.S.
Lecturer to the London School of Tropical Medicine.

Whilst assisting Sir Patrick Manson in the compilation of the fourth edition of his classic manual on tropical diseases, my attention was drawn particularly to the *Linguatulidæ* on account of their great zoological, biological and medical interest. Soon after, in this Journal (January 15, July 15, September 1, 1910, November 1, December 16, 1912), I described the species that had been recognized in man throughout the world, and I pointed out the confusion then prevailing amongst authors with regard to *Porocephalus armillatus* (an Ethiopian species), *Porocephalus moniliformis* (an Oriental species), and *Porocephalus crotali* (an assemblage of Neotropical species). I separated and described the several species lumped under the last name, and suggested their possible occurrence in man in order to explain cases of "porocephaliasis" reported from America. These were ascribed erroneously to the African species under the name of *Pentastomum constrictum*, given by von Siebold in 1852, to its nymphal form. Further, at a meeting of the Society of Tropical Medicine and Hygiene (January, 1910), conjointly with Maître Clement Vaney of the University of Lyons, I described three new tongue-worms belonging to the Arthropod collection of the Paris Natural History Museum. After reading the conjoint paper, I suggested the formation of a new genus: *Raillietiella* to include *Porocephalus boulengeri* Vaney and Sambon, *Pentastomum furcocercum* Diesing, and Dujardin's "*Pentastome du Gecko de Siam*" (*Pentastomum geckonis* Diesing). I briefly described also, or merely mentioned other new species such as *Reighardia cincinnalis*, a large and striking spirally-coiled tongue-worm collected by Professor Leiper in the lungs of a Nilotic crocodile, which he shot at Fajao whilst engaged in his researches on the biology of the Egyptian Schistosomidæ. Since the publication of these papers several communications on *Linguatulidæ* have appeared, written by physicians or zoologists who, ignoring not only my work but the whole literature of the subject, repeat the old mistakes and describe old species for new.

I propose here to submit a classification of the *Linguatulidæ* such as I conceive it, briefly describing all known species and listing, in separate indexes, the regional distribution, known hosts and various synonyms of each species. This, I trust, will prove helpful to collectors of linguatulids, who thus will be enabled to easily determine the species of linguatulids which they may find and eventually to describe new ones.

The taxonomic rank of the *Linguatulidæ* has ever been a puzzle to zoologists and even now continues to be a matter of controversy. At first, owing to their pronounced vermiform appearance, they were taken for *Cestoda* (Chabert, Abilgaard), *Trematoda* (Rudolphi, Humboldt), *Acanthocephala* (Humboldt, Welch), *Nematoda* (Nordmann), and *Hirudinea* (Winsberg). It was Van Beneden (1848) who first recognized their *Arthropod* nature, but he placed them among the *Crustacea*. Schubart (1853), however, suggested their probable relationship with the *Acarina*, and Leuckart (1860) adduced important anatomical and embryological evidence in support of this view. Recently, several authors have questioned the correctness of placing the *Linguatulidæ* in the order *Acarina;* some have even assailed their *Arthropod* nature. Lang (1888) says: "It is by no means proved that the *Linguatulidæ* belong to the Arachnida, we are not even in a position strictly to prove that they are *Arthropoda*," and Pocock (1897) adds: "The evidence that they belong to the *Arthropoda* seems to me far from conclusive." Ihle (1899) says "they have no relationship whatever with the *Arachnida*, but must be considered, like the *Pantopoda*, as a special class of the sub-phylum *Tracheata*."

Having had the opportunity of studying a considerable number of Linguatulids in their various developmental stages, from egg to adult, I am of opinion that these worm-like organisms should be

regarded as greatly modified endoparasitic descendants of the *Acarina*. To the structural features adduced by Leuckart to prove their acarine nature, I can add some new and important ones, such as the anterior position of the female genital opening, a sacciform uterus and six-legged larvæ which characterize the genera *Raillietiella* and *Reighardia*. Further facts in favour of a genetic relationship with the mites, notwithstanding change of habitat and resulting great structural modifications, are the continued habits of feeding upon the blood of their hosts and of fostering and propagating the blood parasites of the latter. The fact that the hæmogregarines of reptiles and mammals develop their sporogonic cycle in ticks, blood-sucking mites and tongue-worms, certainly suggests a relationship between these various forms, notwithstanding their great diversity of form. However, no great weight should be given to this suggestion, since among fish and amphibians it is the phlebotomus leech that fosters hæmogregarine sporogony.

A tendency to adopt internal parasitism as a safer means of livelihood is strongly marked in various groups of the *Acarina*. Thus, whilst the majority of known genera live as temporary or permanent parasites on mammals, birds, insects, molluscs and plants, several have become internal parasites. The sinuous galleries excavated by itch mites (*Sarcoptidæ*) in the corneous layer of the skin of man and animals have been known since the days of Aristotle. Some genera (*Dermoglyphus, Cheletoides*) live within the barrel of birds' feathers. The genera *Otodectes, Acaropsis, Raillietia, Cheyletus* inhabit the external auditory meatus of man and animals, occasionally entering the middle ear and the mastoid cells. The *Rhinonyssinæ* are blood-sucking acarina inhabiting the nasal cavities of birds, other forms (Helarachne) being found in the nasal cavities of mammals, such as seals, for instance. Pneumonyssus occurs in the lungs of monkeys. *Laminosioptes cysticola* is a parasite of gallinaceous birds usually found in the areolar connective tissue beneath the skin, between the muscles, or under the serous membranes. *Cytoleichus nudus* is a well-known form inhabiting the air sacs and bronchial tubes of fowls and pheasants, sometimes producing catarrhal symptoms and, occasionally, asphyxia. They are found also in nodules on the liver, kidneys and other organs. Finally, I must mention the *Phytoptidæ* and *Demodicidæ*, microscopic mites which have become greatly simplified during the process of adaptation to the conditions of endo-parasitism, and now closely resemble the *Linguatulidæ* in their elongate, vermiform, externally ringed body. The *Phytoptidæ* live on plants, and nearly all produce galls. The *Demodicidæ* live within the hair follicles and sebaceous glands of man and animals. They may give rise to various mycetic and bacterial dermatoses by introducing germs collected during their migrations over the cutaneous surface.

Family LINGUATULIDÆ.

Blood-sucking, endoparasitic *Acarina*. Body legless, elongate, vermiform, and more or less markedly annulated. Mouth round, squarish, or elliptical, provided with a chitinous armature of varied structure, and situated either before, behind, or between two pairs of hollow, retractile, fang-like chitinous hooks emerging from four longitudinal pits or pouches disposed in trapezoidal formation or archwise. These hooks may be either equal or unequal, smooth or serrated, single or binate. Anus terminal or subterminal. Sexes divided; female larger than male. Genital opening on mid-ventral line; at anterior end of abdomen in male; either at anterior or posterior end of abdomen in female. When at posterior extremity, the latter opens more or less near anus, but always anterior to it. The ovary is a long, dorsally-placed organ, usually extending almost the whole length of the abdomen. Anteriorly it divides into two oviducts, which bestride the alimentary canal, pass the spermathecæ, receive the spermathecal ducts, and unite, forming either a wide egg-sac or a long tube, which combines the functions of both uterus and vagina. When tubular, the utero-vagina runs in a straight line to the posterior end in the virgin and permits of copulation, but becomes

Hooks of *Linguatulidæ*. (*a*) Outer hook of *Alofia ginæ* with its base complete. (*b*) outer hook of *Kiricephalus coarctatus*. (*c*) Outer hook of *Alofia ginæ*. (*d*) Serrated hook of *Sebekia wedli*. (*e*) Outer hook of *Porocephalus stilesi*, with accessory spine.

greatly elongated in the gravid female, forming numerous and complex gyrations. Its coils may be amassed either above or below the alimentary canal, or they may be twined around it. Accordingly, the alimentary tube is either dorsal, ventral, or axial. These anatomical details are given here because of their taxonomic importance. They are usually discernible in fully distended females owing to the transparency of the integument, but, in any case, they may be easily detected after clarification by the usual methods.

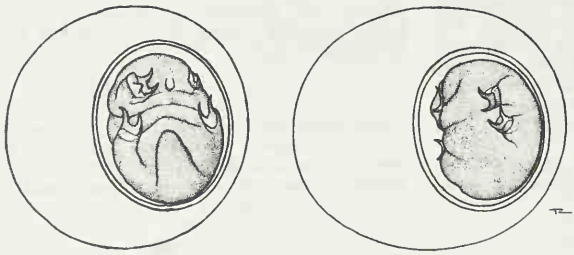
The eggs are enclosed in a thin bladder-like envelope filled with an albuminous substance clear as glass, and contain within their thick chitinous shell an oval embryo with rudimentary mouth parts and either six or four legs, each one tipped with two strong claw-like hooks. On the back of the embryo may be seen the so-called dorsal organ or facette.

The family *Linguatulidæ* comprises two subfamilies: *Raillietiellinæ* and *Porocephalinæ*.

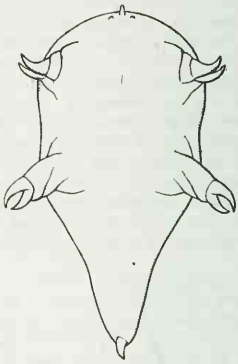
Raillietiellinæ Sambon, 1922, new subfamily.

Subfamily diagnosis.—Linguatulidæ: Female genital opening at anterior end of abdomen. Utero-vagina straight, ample, sacciform. Mouth anterior to hooks. Salivary glands moderately devoloped. Larva with six short, stumpy legs.

Type-genus.—Raillietiella Sambon, 1910.



Eggs of *Porocephalus subulifer* with fully developed embryo.



Embryo of *Armillifer armillatus.*

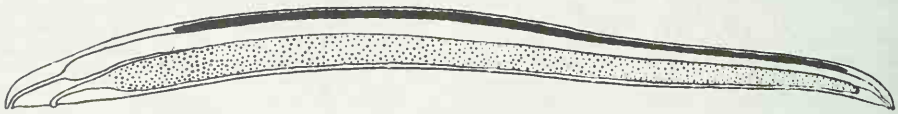


Diagram showing distinctive characters of Sub-family *Raillietiellinæ.*

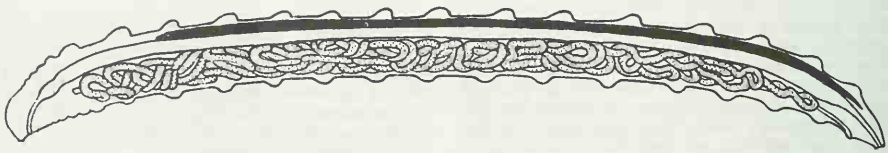


Diagram showing distinctive characters of Sub-family *Porocephalinæ.*

Porocephalinæ Sambon, 1922, new subfamily.

Subfamily diagnosis.—Linguatulidæ: Female genital opening at posterior end of abdomen. Utero-vagina tubular, greatly elongated, and forming numerous windings. Mouth in a line with or posterior to hooks. Salivary glands greatly developed, extending whole length of body on either side of alimentary tube. Larva with four legs.

The subfamily *Raillietiellinæ* comprises two genera: *Raillietiella* and *Reighardia.*

Genus Raillietiella Sambon, 1910.

Generic diagnosis.—Raillietiellinæ: Body cylindrical, long, slender, somewhat flattened ventrally, tapering at both ends. Integument smooth, transparent. Mouth well in advance of hooks; opens on a terminal projection. Hooks simple, unequal, placed in trapezoidal formation; anterior pair smaller than posterior. Three vesicular projections about each hook, one anterior, globular, ensheathing the hook, the other two hemispherical, one on each side. Two vesicular projections placed dorsally on each side of cephalothorax, on a level with anterior pair of hooks. Posterior extremity bifid; terminal lobes divergent. Anus between terminal lobes.

Six species described from Oriental, Ethiopian and Neotropical regions. Adult form parasitic in *Ophidia*, *Lacertilia* and *Bufonidæ*.

Type species.—Raillietiella boulengeri Vaney and Sambon, 1910.

Raillietiella boulengeri Vaney and Sambon, 1910.

Synonyms.—Porocephalus boulengeri Vaney and Sambon, 1910; *Raillietiella boulengeri* Sambon, 1910.

Specific diagnosis.—Raillietiella: Body elongate, fusiform, slightly curved ventrally. Female, length: 35-45 mm. Cephalothorax triangular in shape, 1 mm. to 1·5 mm. in length, 2 mm. in width at base. Mouth presents outline of inverted thimble. Anterior hooks measure 0·24 mm. in length, the posterior ones 0·31 mm. Body annulation not very distict, c. 25-30 rings in female. Eggs are oval in shape and measure 85 microns by 70 microns.

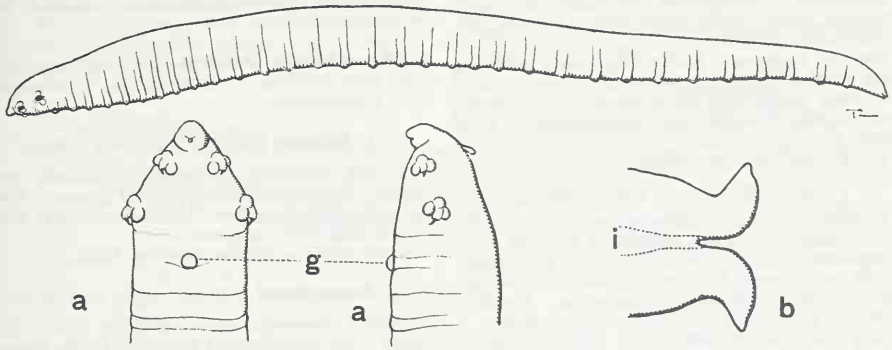
Hosts—From peritoneal cavity of Gaboon Puff Adder (*Bitis gabonica*) and trachea of Common Puff Adder (*Bitis arietans*). Other specimens collected by Mrs. Pixell from *Zamenis ravigieri*.

Raillietiella furcocerca (Diesing, 1835) Sambon, 1910.

Synonyms.—Pentastoma furcocercum Diesing, 1835; *Pentastomum bifurcatum* Diesing, 1850; *Porocephalus bifurcatus* Sbipley, 1898; *Raillietiella furcocerca* Sambon, 1910.

Specific diagnosis.—Raillietiella: Length of female, 20-22 mm. Rings c. 40. Moutb elliptical. Hooks geminate in nymphal form.

Hosts.—Boa constrictor, Zamenis constrictor, Drymobius bifossatus, Amphisbæna alba.



Raillietiella boulengeri showing distinctive characters of genus *Raillietiella*. (*a*) Anter.-extrem. (*b*) Post-extrem. (*g*) Female genital opening. (*i*) Intestine.

Raillietiella geckonis (Diesing, 1850) Sambon 1910.

Synonyms.—Pentastomum geckonis Diesing, 1850; *Raillietiella geckonis* Sambon, 1910.

Specific diagnosis.—Raillietiella: Length: 16-18 mm.; width, 1·6-1·8 mm. Hooks unequal, anterior measure 0·25 mm. in lengtb, posterior 0·33 mm., eacb one bears on its inner surface, close to tbe base, one or two flexuous stylets. Eggs elliptical, measure 0·070-0·089 mm. in length. They are distinctly operculated at one extremity (Dujardin).

Hosts.—The Siamese Gecko (probably *Gecko verticillatus*).

This species was described by Dujardin (1845) in his "*Histoire Naturelle des Helminthes ou Vers Intestinaux*" from specimens in tbe collection of the *Muscum d'Histoire Naturelle*, Paris. Dujardin noticed that the oviduct ended in a blind sac posteriorly, and therefore thought that it must open elsewhere than at the tail end, but he did not find the opening.

Raillietiella indica Gedoelst, 1921.

Specific diagnosis.—Raillietiella: Length: 3·6 mm; maximum width, 0·83 mm. Mouth orbicular. Body rings: 25.

Hosts.— Bufo melanostictus, India.

Raillietiella orientalis (Hett, 1915) Sambon 1922.

Synonyms.—Porocephalus bifurcatus var. *orientalis* Hett, 1915; *Raillietiella bifurcata* var. *orientalis* Gedoelst, 1921.

Specific diagnosis.—Raillietiella: Body more slender than *R. furcocrea;* rings 40 or more. Mouth more oval, anterior end of cephalothorax more rounded (Hett).

Hosts.—Zamenis mucosus, Naia tripudians, India.

Raillietiella mediterranea (Hett, 1915) Sambon, 1922.

Synonyms.—Porocephalus bifurcatus var. *mediterraneus* Hett, 1915; *Raillietiella bifurcata* var. *mediterranea* Gedoelst.

Specific diagnosis.—Raillietiella: Body relatively more slender than in *R. orientalis.* The length of the males varies from 10 to 15 mm., that of the females from 20 to 30 mm. Annulations 40 to 45 (Hett).

Hosts.—Zamenis gemonensis.

Genus Reighardia Ward, 1899.

Generic diagnosis.—Raillietiellinæ: Body cylindrical, elongate, slightly attenuated at both ends. Integument covered with stud-like projections. Mouth in advance of hooks. Hooks exceedingly minute, placed in trapezoidal formation. Posterior extremity bluntly rounded and curved ventrally.

Only one species known from Holarctic region.

Adult form parasitic in air sacs of Gulls and Terns (*Laridæ*). Nymphal form probably encysted in fish:

Type species.—Reighardia sternæ (Diesing, 1864) Ward, 1899.

Reighardia sternæ (Diesing, 1864) Ward, 1899.

Synonyms.—Linguatula delle rondini di mare De-Filippi, 1861; *Pentastomum sternæ hirundinis* Diesing, 1864; *Pentastomum sternæ* Diesing, 1864; *Pentastomum laponica* Mégnin (this name was never published, but is written by Mégnin on the specimens of his collection now at the Ecole de Médecine, Paris); *Pentastomum lari* Mégnin, 1883; *Porocephalus lari* Shipley, 1898.

Specific diagnosis.—Reighardia: Body cylindrical, anterior end more slender and tapering, posterior extremity rounded and curved ventrally. Annulation almost entirely obliterated in mature females. Length of female, 39 mm. Mouth oval, hooks very minute. Intestine large and presenting some flexuosities; it is full of a dark, opaque sepia-like substance. Eggs oval, 0·14 by 0·09 mm. Embryo provided with three pairs of legs (De Filippi, Leuckart).

Hosts.—Glaucous Gull (*Larus glaucus*); Bonaparte's Gull (*Larus philadelphia;* Common Tern, *Sterna fluviatilis.*

The subfamily *Porocephalinæ* may be divided into three sections: I. *Sebekini*, II. *Porocephalini*, III. *Linguatulini.*

I. **Sebekini** Sambon, 1922, new section.

Section diagnosis.—Porocephalinæ: Body cylindrical. Well-marked latero-ventral grooves. Hooks in trapezoidal formation. Alimentary canal dorsal, longer than body, sinuous.

Type genus.—Sebekia Sambon, 1922.

II. **Porocephalini** Sambon, 1922, new section.

Section diagnosis.—Porocephalinæ: Body cylindrical. No latero-ventral grooves. Hooks disposed archwise. Alimentary canal dorsal or axial, not longer than body, straight.

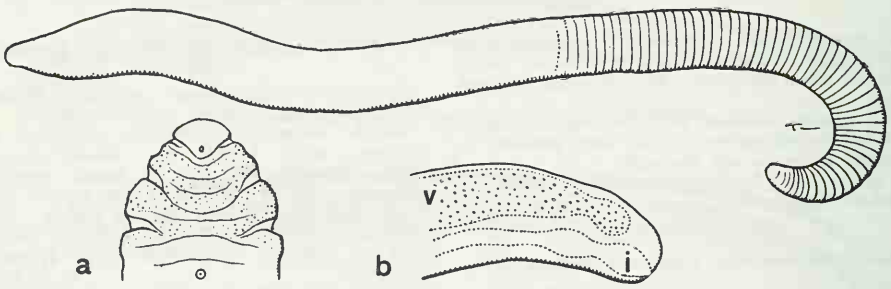
Type genus.—Porocephalus Humboldt, 1811.

III. **Linguatulini** Sambon, 1922, new section.

Section diagnosis.—Porocephalinæ: Body flattened fluke-like, more or less convex in middle part of dorsal surface, sides depressed. Hooks disposed archwise. Alimentary canal axial. Utero-vagina twines around it.

Type genus.—Linguatula Frölich, 1789.

Sebekini comprise three genera: *Sebekia, Alofia* and *Leiperia.*



Reighardia sternæ showing distinctive characters of genus *Reighardia.* (*a*) Anter.-extrem. (*b*) Post-extrem. (*i*) Intestine. (*v*) Utero-vagina.

Genus **Sebekia** Sambon, 1922, new genus.

Synonyms.—Pentastoma Rudolphi, 1819 (in part); *Pentastomum* Diesing, 1835; *Porocephalus* Stiles, 1893; *Reighardia* Sambon, 1910.

Generic diagnosis.—Sebekini: Body small, massive, closely annulated (annuli c. 80). Cephalothorax very small, wedge-shaped, projecting nipple-like from gross abdomen, ventral side continuous with that of abdomen. Mouth subterminal, shaped more or less like an inverted U, with free ends approximated.[1] Hooks very small, distance between anterior and posterior hook-lines small. Hooks single, equal, with convex surface serrated (see illustration). Alimentary canal longer than body, forming sinuous loop about junction of anterior with median third of body. Anus terminal. Utero-vagina long, much convoluted, amassed beneath alimentary tube. Ovary sinuous. Genital opening slightly anterior to anus.

Six species described from Oriental, Ethiopian, Neotropical and Australasian regions. Adult forms parasitic in Crocodilians and Monitors. Nymphal forms probably in fish.

Type species.—Sebekia wedli Giglioli, 1922, new species.[2]

Sebekia wedli Giglioli, 1922, new species.

Synonyms.—Pentastoma oxycephalum var. *minor* Wedl, 1861.

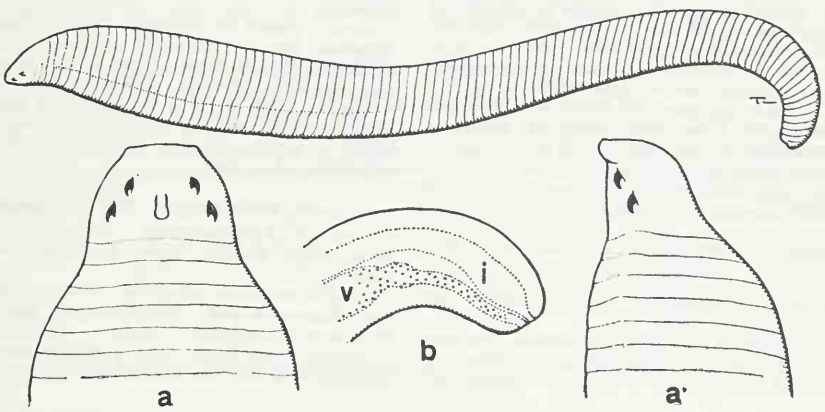
Specific diagnosis.—Sebekia: Length of female: 10-25 mm.; width: 1·5-2 mm. Male about two-thirds of female, body more slender (Wedl). Annuli c. 80 (Wedl counted 100 and more). Mouth (see illustration). Hooks simple in adult, with accessory spine in nymphal forms (Wedl). Eggs elliptical, their diameter measured at the inner chitinous shell c. 0·064 mm. (Wedl).

Hosts.—Found in bronchi of *Crocodilus niloticus*, Africa.

Sebekia cesarisi Giglioli, 1922, new species.

Specific diagnosis.—Measurements of female, 15 by 2 mm. Annuli could not be determined on account of bad preservation. Mouth (see illustration).

Hosts.—Collected by Prof. Leiper from lungs of *Crocodilus* sp. Africa.



Sebekia wedli, showing distinctive characters of genus *Sebekia*. *a* and *a'*, anterior extremity.; *b*, posterior extremity; *i*, intestine; *v*, utero-vagina.

Sebekia divestei Giglioli, 1922, new species.

Specific diagnosis.—Female length: c. 10 mm.; width: 2 mm. Annuli c. 75. Mouth (see illustration).

Hosts.—From lungs of American crocodile (*Crocodilus americanus*).

Sebekia oxycephala (Diesing, 1835) Sambon, 1922.

Synonyms.—Pentastoma proboscideum Rudolphi, 1819 (in part); *Pentastoma oxycephalum* Diesing, 1835; *Pentastomum oxycephalum* Diesing, 1850; *Porocephalus oxycephalus* Stiles, 1893; *Pentastoma proboscideum crocodili scleropis* Rudolphi (Shipley). This last synonym is a mistake, Rudolphi never used the name of the Common Caiman as a specific or sub-specific designation, but only to indicate a new host for *Pentastoma proboscideum*.

Specific diagnosis.—"*Corpus cylindricum, rectum aut (in minoribus) incurvatum, annulato-plicatum, plicis pro magnitudine crescente evanes-*

[1] Dr. Giglioli, who has been studying the *Sebekini* very minutely, points out that the shape of the mouth is of taxonomic importance. Here rough drawings of the mouth structures will replace descriptions.

[2] Dr. G. Giglioli has kindly allowed me to mention in this synopsis some new species which he has not yet published. Their publication here, therefore, should be considered as a preliminary notice by Dr. Giglioli himself.

centibus. Cephalothorax minime distinguendus, antrorsum acuminatus, truncatus, fronte prominulus. Abdominis latitudo retrorsum decrescens in minoribus, crescens in maximis; extremitas analis truncata. Annuli c. 60, breves, lineares, unica serie stigmatum instructi. Uncinorum curvatura ad basin approximata, apice pæne recto. Pars basalis in minoribus inflata, spinulosa, in maximis integra. Fulcrum latum, elongatum, rotundatum. Orificium oris angustum. Longitudo fœminæ usque ad 25 mm., latitudo maxima 3·4 mm. Mas multo minor, long. 10 mm.; latit. antice 1·7; postice, 1 mm. Habitat gregatim in pulmone bronchiisque crocodili sclerops et acuti." (Leuckart.)

To this diagnosis Leuckart appends the description of what he considers to be an immature form of the above.

"*Status imperfectus gracilescens, subfusiformis, corpore incurvato, hamulis geminatis, fimbriisque ad marginem annulorum posteriorem impositis. Hamulus accessorius unciformis, gracilis. Fimbriæ tenues, brevisculæ, distantes, in extremitate posteriore corporis omnino deficientes. Longitudo* 7 mm., *latitudo* 0·8 mm. *Ex habitaculo nescio quo translatum, in pulmonibus alligatoris promiscue cum exemplaribus minoribus* (10-18 mm.), *statum perfectum exhibentibus collegi.*"

Hosts.—Common Caiman (*Caiman sclerops*) and American Crocodile (*Crocodilus americanus*).

Sebekia (?) *jubini* (Vaney and Sambon, 1910) Sambon, 1922.

Synonyms.—*Porocephalus jubini* Vaney and Sambon, 1910.

Specific diagnosis.—"A single female specimen belonging to the Paris Natural History Museum. Length: 42 mm.; width: 4·5 mm. at anterior extremity, and 3·5 mm. at posterior end. Mouth suboval. Hooks very small and arranged at corners of an isosceles trapezoid, the wide base of which, limited by the outer hooks, is at the level of the mouth. The short base, formed by the inner hooks, is situated considerably above the mouth opening. The single specimen being a fully mature female, the body annulations are completely effaced. Posterior extremity obtuse. Anus terminal. Ova measure, 0·060 mm. by 0·050 mm." (Vaney and Sambon.)

Hosts.—Found in nasal cavity of Siamese Crocodile (*Crocodilus siamensis*), which inhabits Siam, Cambodia and Java.

Sebekia (?) *lohrmanni* (Sambon, 1910) Sambon, 1922.

Synonyms.—*Pentastomum clavatum* Lohrmann, 1889; *Porocephalus clavatus* Shipley, 1898; *Reighardia lohrmanni* Sambon, 1910.

Specific diagnosis.—"Body of adult female club-shaped, slightly flattened on ventral surface; greatest width at posterior limit of anterior quarter; from this the body rapidly lessens in front and more slowly behind. Length, 13-17 mm.; greatest width, 3 mm. Hooks and mouth very small and closely compressed at the tip of body." (Lohrmann.)

Hosts.—Found by Lohrmann in the lungs of the Egyptian Monitor (*Varanus niloticus*), a widely distributed African lizard, more or less aquatic in its habits and said to live largely on fish.

Shipley (1898) found a linguatulid in the lungs of the Ocellated Monitor (*Varanus ocellatus* Rup.), which he ascribes to this species, though it has only thirty-nine rings.

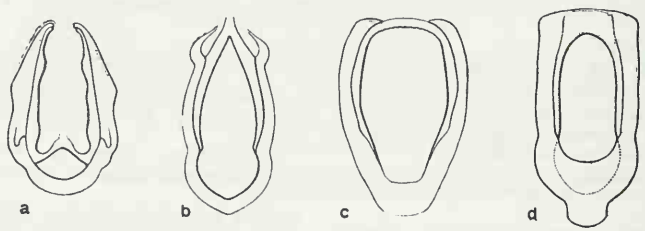
Genus **Alofia** Giglioli, 1922, new genus.

Synonyms.—*Pentastomum* Lohrmann, 1889; *Porocephalus* Shipley, 1898; Reighardia Sambon, 1910.

Generic diagnosis.—*Sebekini:* Body small, massive, banana-shaped. Cephalothorax large, continuous with abdomen. Annuli c. 70-75. Mouth U-shaped, very large, with posterior margin on posterior hook-line and anterior end above anterior hook-line. Hooks comparatively large, single, equal and smooth. Alimentary tube largely sinuous. Utero-vagina ventral, convoluted. Anus terminal. Genital opening contiguous.

One valid and two doubtful species described. Two from Samoa, the third of unknown locality. Hosts unknown, probaby fish.

Type species.—*Alofia ginæ* Giglioli, 1922, new species.



Chitinous oral armatures of *Sebekini*. *a, Sebekia wedli; b, S. cesarisi.; c, S. divestei; d, Alofia merki.*

Alofia ginæ Giglioli, 1922, new species.

Specific diagnosis.—Female, length: 15-20 mm.; width: 2-3 mm.; male, length, 16 mm.; width, 2·2 mm. Annuli c. 75. Mouth (see illustration).

Hosts.—Unknown. Specimens kindly submitted for determination by Prof. L. Merk of the University of Innsbruck. They were collected in Samoa, probably from some fish.

Alofia (?) *platycephala* (Lohrmann, 1889) Giglioli, 1922.

Synonyms.—Pentastomum platycephalum Lohrmann, 1889; *Porocephalus platycephalus* Shipley, 1898; *Reighardia platycephala* Sambon, 1910.

Specific diagnosis.—" Body of adult female almost cylindrical, thickest part at posterior end. Head flat, obtuse, slightly more slender than body. Hooks small and at wide intervals from one another. The somewhat elongate mouth is situated between the anterior pair of hooks. Rings about 70, scarcely visible. Length, 23 mm.; breadth, 2·8 mm. Hook glands consist exclusively of two gland bodies attached to the intestine. Host unknown; possibly Alligator." (Lohrmann.)

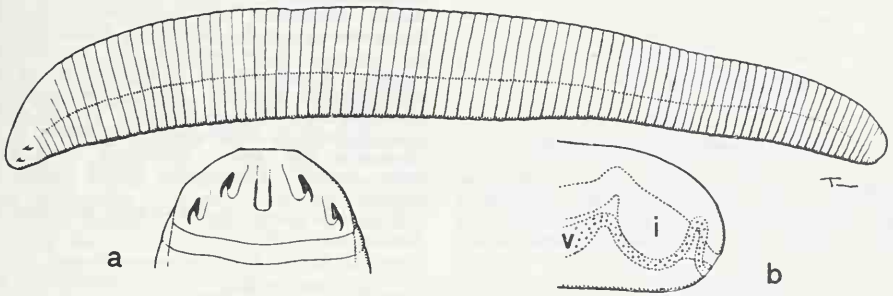
Alofia (?) *merki* Giglioli, 1922, new species.

Specific diagnosis.—Female, length, 15 mm.; width, 3 mm.; annuli, c. 75.

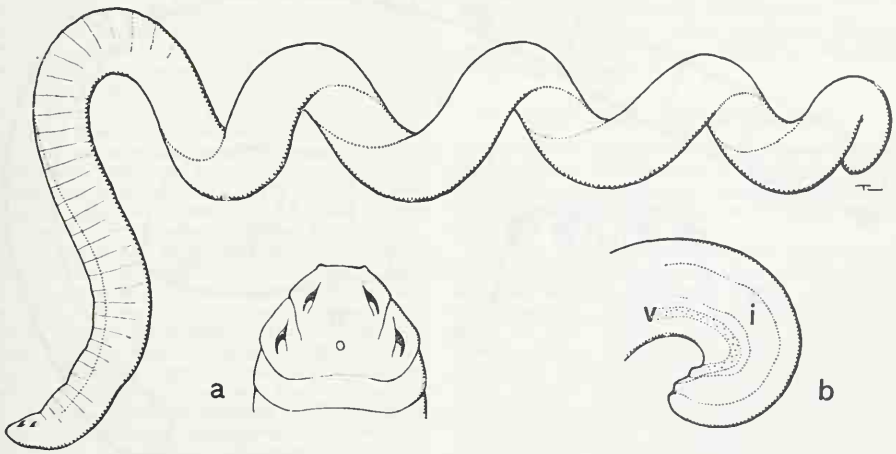
Hosts.—Collected in Samoa. Host not known. Kindly submitted by Prof. L. Merk of Innsbruck for determination.

Genus **Leiperia** Sambon, 1922, new genus.

Generic diagnosis.—Sebekini: Body large, cylindrical, elongate, more or less spirally coiled. Hooks in trapezoidal formation, simple, equal, smooth.



Alofia ginae, showing distinctive characters of genus *Alofia*. *a*, anterior extremity; *b*, posterior extremity: *i*, intestine; *v*, utero-vagina.



Leiperia cincinnalis, showing distinctive characters of genus *Leiperia*. *a*, anterior extremity; *b*, posterior extremity; *i*, intestine: *v*, utero-vagina.

Distance between hook-lines relatively great. Mouth small, situated on posterior hook-line. Utero-vagina beneath slightly sinuous alimentary tube. Posterior extremity tapering somewhat at the very end. Anus terminal. Female genital opening slightly anterior to anus.

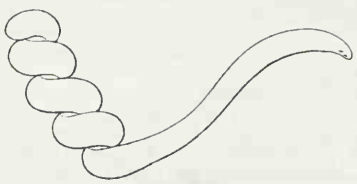
One species from Nilotic Crocodile (*Crocodilus niloticus*).

Type species.—*Leiperia cincinnalis* (Sambon, 1910) Sambon, 1922.

Leiperia cincinnalis (Sambon, 1910) Sambon, 1922.

Synonyms.—*Reighardia cincinnalis* Sambon, 1910.

Specific diagnosis.—*Leiperia:* Length of female, 108-124 mm.; width, 3-4 mm. Body almost cylindrical, somewhat flattened ventrally. The posterior two-thirds curled into a spiral of four or five rounds. Body annulation visible only on the anterior third, from base of cephalothorax to first round, where from 60 to 62 rings may be counted; on the posterior two-thirds it is entirely effaced Cephalothorax almost triangular in shape; measures c. 2 mm. in length by 3 mm. in width at its base; the hooks are single and equal.



Leiperia cincinnalis closely coiled posteriorly.

Hosts.—Collected by Prof. R. T. Leiper from lung of a Nilotic Crocodile (*Crocodilus niloticus*).

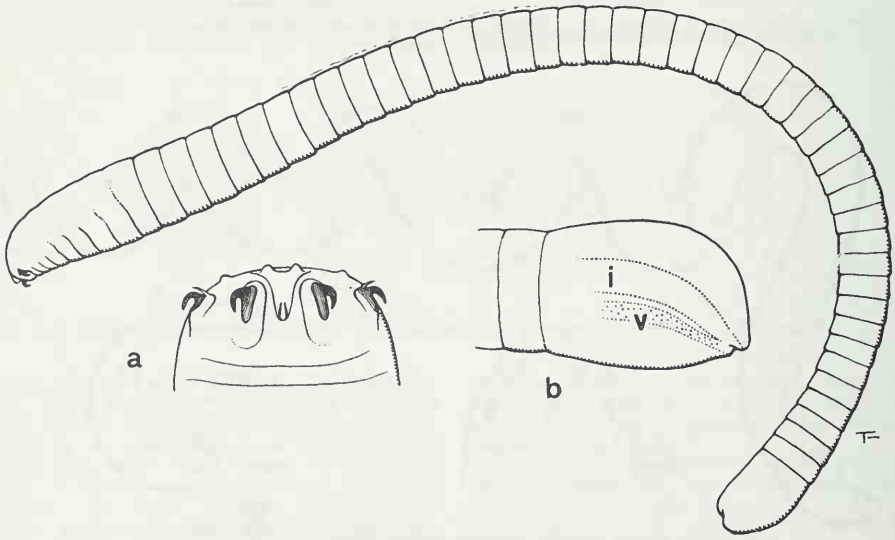
The *Porocephalini* comprise four genera: *Porocephalus*, *Kiricephalus*. *Armillifer* and *Waddycephalus*.

Genus **Porocephalus** Humboldt, 1811.

Synonyms.—*Echinorhynchus* Humboldt, 1808; *Distoma* Humboldt, 1808; *Polystoma* Rudolphi, 1812; *Pentastoma* Rudolphi, 1819; *Linguatula* Van Beneden, 1849; *Pentastomum* Diesing, 1850.

Generic diagnosis.—*Porocephalini:* Body club-shaped; posterior half curved more or less ventrally; terminal segments dilated into characteristic olive-shaped enlargement. Annuli smooth. Cephalothorax bluntly rounded anteriorly. Hooks unequal, inner simple, outer provided with non-caducous accessory spine; disposed in slightly arcuate line with convexity posterior. Mouth ovate, placed on inner-hook line. Anus subterminal. Female genital opening placed on terminal segment anterior to and contiguous with anus. Alimentary canal axial, short, straight. Utero-vagina twined around alimentary tube.

Four valid species described from Ethiopian and Neotropical regions.



Porocephalus stilesi, showing distinctive characters of genus *Porocephalus*. *a*, anterior extremity; *b*, posterior extremity; *i*, intestine; *v*, utero-vagina.

Adult forms parasitic in Ophidians, nymphal forms encysted in mammals. Probably attacks man also.

Type species.—Porocephalus crotali Humboldt, 1811.

Porocephalus crotali Humboldt, 1811.

Synonyms. Adult form.—Echinorhynchus crotali Humboldt, 1808; *Distoma crotali* Humboldt, 1808; *Distoma crotali durissi*, Rudolphi, 1809; *Porocephalus crotali* Humboldt, 1811; *Polystoma proboscideum* Rudolphi, 1814; *Pentastoma proboscideum* Rudolphi, 1819; *Linguatula proboscidea* Van Beneden, 1849 (in part); *Pentastoma proboscoïdcum* Mayer, 1852 (misprint); *Porocephalus humboldtii* Mayer, 1852; *Linguatula quadriuncinata* Mayer, 1852; *Pentastoma moniliforme* Mégnin, 1880 (in part); *Pentastoma proboscidium* Gottheil, 1889 (misprint). *Nymphal form.—Pentastoma subcylindricum* Diesing, 1836; *Pentastomum subcylindricum* Diesing, 1850.

Specific diagnosis.—Porocephalus: "Bright yellow in fresh specimens. Body elongate, incurved, cylindrical, somewhat flattened ventrally, larger and clavate at anterior extremity, tapering posteriorly and becoming again slightly larger and rounded at the posterior end, which terminates ventrally in a short conical point. Annuli over 80. Humboldt's largest specimens found in the Dog-faced Rattlesnake (*Crotalus terrificus*) measured 62 mm. in length by 8 mm. across the anterior extremity and 2 mm. across the posterior end. Leidy's largest specimen found in the Diamond-back Rattlesnake (*Crotalus adamanteus*) measured 65 mm. in length by 6 mm. in breadth. Both these were no doubt female specimens.

I have seen only one poorly preserved female specimen of this species in the collection of the Paris "Museum d'Histoire Naturelle." It was found in 1896 by L. Diguet in a rattlesnake of undetermined species killed in Tortuga Island, Gulf of California. It presented over eighty annulations, an ovate mouth, placed on a line with the hooks and two prominent antenniform papillæ above the mouth. I did not examine the specimen carefully under magnification, and am therefore unable to state whether the outer hooklets were provided with accessory spine as in the case of other closely allied species (*P. clavatus, P. stilesi, P. subulifer*).

The Linguatulid from the Murine Opossum (*Marmosa murina*) described by Diesing in 1835 under the name of *Pentastoma subcylindricum*, and presenting over eighty annulations, is probably the nymphal form of *Porocephalus crotali*." (Sambon.)

Hosts.—Adult form.—Crotalus terrificus Laur., *Crotalus horridus* Linn., *Crotalus adamanteus* (Beauvois), *Crotalus durissus* Linn. *Nymphal form:* (?) *Leontocebus chrysopygus*, (?) *Phyllostoma discolor*, (?) *Procyon cancrivorus*, (?) *Oryzmys pyrrhorhinus*, (?) *Akodon fuliginosus*, (?) *Tatusia peba*, (?) *Caluromys philander*, (?) *Marmosa murina*.

Porocephalus clavatus (Wyman, 1845) Sambon, 1910.

Synonyms.—Adult form.—Linguatula clavata Wyman, 1847; *Linguatula proboscidea* Van Beneden, 1849 (in part); *Pentastomum proboscideum* Leidy, 1856 (in part); *Pentastomum clavatum* Leuckart, 1860; *Pentastoma imperatoris* Macalister, 1875; *Pentastoma moniliforme* Mégnin, (in part). *Nymphal form.—Pentastomum didelphidis virginianæ* Leidy, 1852.

Specific diagnosis.—Porocephalus: Body claviform, elongate, more or less incurvated. Cephalothorax rounded anteriorly, flattened or slightly convex ventrally, strikingly gibbous dorsally. The tapering posterior portion terminates with a slight, bulb-like obconical expansion. Female, length: 75-86 mm.; width, 4½ mm. across widest part of anterior extremity and 2½ mm. across the narrowest part of posterior end just before terminal swelling, the diameter of which is 3 mm.; male, length: 25-36 mm., maximum width, 2 mm. Annuli: 35 to 43, distinctly visible throughout the length of the body except over dilated terminal portion. Mouth almost oval. Hooks about equal in size, sharply curved and with robust points; they are longitudinally striated and measure about ½ mm. in length. Inner hooks simple, outer ones provided with a permanent, straight accessory spine placed on their back like the point over the hook of a boat-hook, or the spear over the axe of a halberd. Anal and sexual orifices in female open conjointly in a subterminal pit on ventral surface with its long axis at right angles with that of the body. In the male the anus is subterminal, the sexual opening is at the anterior end of the body on first or second segment. It is plainly visible on the mid-ventral line, forming a prominent cone tipped by three papillæ, two anterior, one posterior.

Hosts. Adult form.—Boa constrictor, Boa imperator. Nymphal form.—Didelphys virginiana, Caluromys philander.

Porocephalus stilesi Sambon, 1910.

Synonyms.—Pentastoma proboscideum Bremser, 1824 (in part); *Pentastomum proboscideum* Diesing, 1850 (in part); *Linguatula quadriuncinata* Mayer, 1852 (in part); *Porocephalus crotali* Stiles, 1893 (in part).

Specific diagnosis.—Porocephalus: Form of body similar to that of *P. clavatus*, but more uniform in diameter throughout and with a more rounded terminal swelling. Annuli 45 to 50. Female, length: 80 to 96 mm., width 5 to 6 mm. across widest anterior portion, 4½ to 5 mm. across widest portion of terminal swelling, narrowest portion about 4 mm. Male, length: 30 to 38 mm., width 3½ to 4 mm. across anterior end and 1½ across narrowest part of posterior extremity. Mouth oval, with narrowest end foremost. Outer hooks ½ mm. in length, provided with straight, pointed accessory spine; inner ones simple, and slightly larger. Anal and sexual

orifices of female open conjointly in subterminal groove about ½ mm. long, placed on mid-ventral line with its long axis at right angles to that of body. Male sexual opening on first body ring.

Hosts. Adult form.—Found in snakes of the genus *Lachesis*, as in the Surucucu or Bushmaster (*Lachesis mutus*), and the Rat-tailed Pit-viper or Fer-de-lance (*Lachesis lanceolatus*). *Nymphal form.*—Unknown.

almost uniform thickness, tapers slightly anteriorly, and is widest at the posterior extremity, which ends abruptly in a characteristic hemispherical segment. Annulations from 1 to 2 mm. wide, so very indistinct that it is not possible to indicate their exact number. There seem to be from thirty-eight to forty. Alimentary tube and coils of utero-vagina clearly visible through the thin, transparent body wall. Cephalothorax measures 3 mm. in

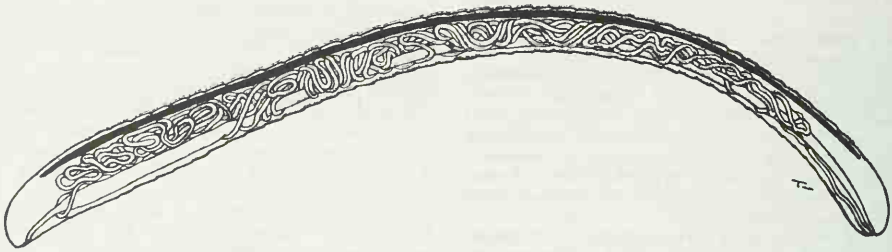
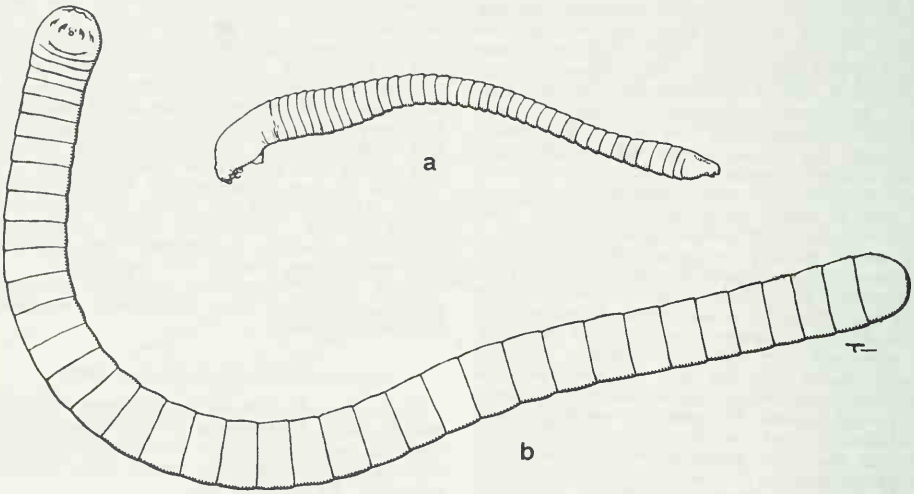


Diagram of *Porocephalus*, showing utero-vagina twined around alimentary canal.



a, male of *Porocephalus clavatus*; *b*, *Porocephalus subulifer*.

Porocephalus subulifer (Leuckart, 1860) Stiles, 1893.

Synonyms. Adult form.—*Porocephalus bouvieri* Vaney and Sambon, 1910. *Nymphal form.*—*Pentastomum subuliferum* Leuckart, 1860; *Porocephalus subuliferus* Stiles, 1893; *Porocephalus cercopitheci* Breinl and Hindle, 1908.

Specific diagnosis.—*Porocephalus:* Adult female specimens vary in length from 60 to 65 mm. and in width from 3 to 4·5 mm. Body cylindrical; of length and about 3 mm. in width; it is obtuse anteriorly, convex on the posterior aspect, slightly flattened on the ventral side. The mouth and hooks are arranged in a slight convex arch close to the anterior margin. Mouth presents a peculiar keyhole outline; it measures 0·31 mm. in length by 0·15 mm. in width; its anterior pole is almost on a level with the upper ends of the inner hookpits. Inner hooks are single, each consisting of a stout, strongly curved chitinous process 0·5 mm.

in length; the outer ones are double. Of the geminate hooks, one, the principal, is similar in size and shape to the single inner hooks; the accessory, placed immediately above the principal, is very slender, only slightly bent, and measures 0·37 mm. in length. Both anus and vagina open close together at posterior extremity. Fully developed ova measure 0·080 mm. in length and 0·067 mm. in width; they are surrounded by a hyaline envelope measuring 0·128 by 0·120 mm. (see illustration).

Hosts. Adult form.—Found by Prof. Vaillant in the stomach of *Simocephalus capensis*, Congo 1896. Major A. Alcock has kindly allowed me to examine specimens of this species collected by Dr. H. Bayon in Uganda from a snake the name of which, unfortunately, is not recorded. Immature forms have been found by Pagenstecher in the larynx of an Egyptian Cobra (*Naia hajc*), by Sambon amongst abdominal muscles of Gaboon Puff-Adder (*Bitis gabonica*) and by Drs. Anton Breinl and Edward Hindle (1909) coiled up and encysted in the lung of a Green Guenon (*Cercopithecus callitrichus*).

Genus **Kiricephalus** Sambon, 1922, new genus.

Synonyms.—*Pentastomum* Diesing, 1850; *Porocephalus* Shipley, 1898.

Generic diagnosis.—*Porocephalini*: Body club-shaped (like the Kaffir "kiri" and other knobbed clubs, sometimes armed with spikes), greatly elongate, of uniform thickness throughout and spirally twisted on its own axis. Annuli smooth. Cephalothorax more or less globular, owing to constriction of anterior body rings brought about by habit of inserting cephalothorax deeply into host's lung. Hooks slightly unequal in size, but simple, without accessory spines. Mouth ovate, placed just below inner hook-line. Anus subterminal. Female sexual opening placed on terminal segment, somewhat anterior to anus. Alimentary canal axial. On account of body torsion, appears to twine around utero-vaginal skein.

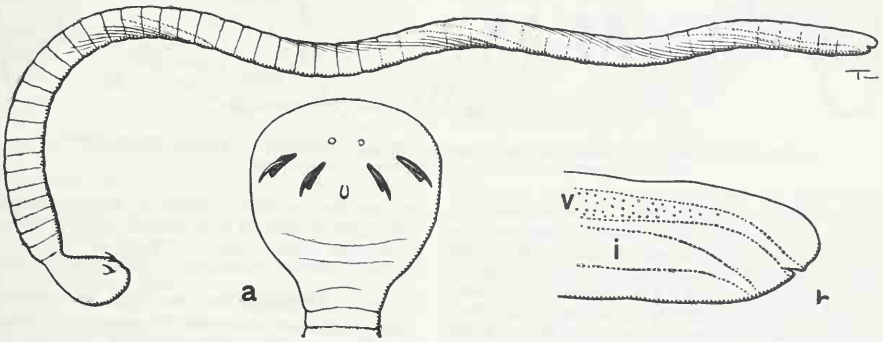
Three valid species described from Oriental, Neotropical and Australasian regions. Parasitic in Ophidia.

Type species.—*Kiricephalus coarctatus* (Diesing, 1850) Sambon, 1910.

Kiricephalus coarctatus (Diesing, 1850) Sambon, 1910.

Synonyms.—*Pentastomum proboscideum* var. *coarctatus* Diesing, 1850 (in part); *Porocephalus seurati* Neveu-Lemaire, 1900; *Porocephalus coarctatus* Sambon, 1910; *Porocephalus globicephalus* Hett, 1915.

Specific diagnosis.—*Kiricephalus*: Adult females vary in length from 76 to 115 mm. Body, of uniform thickness throughout (4 mm. in largest specimens), is somewhat twisted in a drawn-out spiral form. The annulations are very indistinct, especially in the posterior part of the larger specimens; in the smaller specimens they can be made out more or less accurately and number about fifty-two. The cephalothorax is wider than the rest of the body and almost hemispherical, flattened on the ventral surface, rounded on the dorsal aspect. In the larger specimens it measures 5 to 6 mm. in length by 4 to 5 mm. in width. It is followed by a short, well-marked constriction which gives it its rounded appearance. The hooks are placed in a slightly arcuate line. They are single, unequal, the inner ones slightly smaller than the outer ones; the mouth is small, ovate, and placed with the narrowest end foremost. The posterior end of the body terminates in a blunt cone. The anal and sexual orifices seem to open together in a subterminal slit placed on the ventral surface, at right angles to the length of the body.



Kiricephalus coarctatus, showing distinctive characters of genus *Kiricephalus*. *a*, anterior extremity; *b*, posterior extremity; *i*, intestine; *v*, utero-vagina. Apparent dorsal position of utero-vagina due to body torsion.

Hosts.—Found by Natterer in lungs of *Drymobius bifossatus* (Raddi), by Sambon in lungs of Couper's snake (*Coluber corais* var. *couperi* Holbr.),

by Miss Hett in some American variety of *Tropidonotus fasciatus*, and by Seurat amongst the subcutaneous muscles of a Harlequin Elaps (*Elaps fulvius* L.) from Guatemala.

Kiricephalus pattoni (Stephens, 1908) Sambon, 1922.

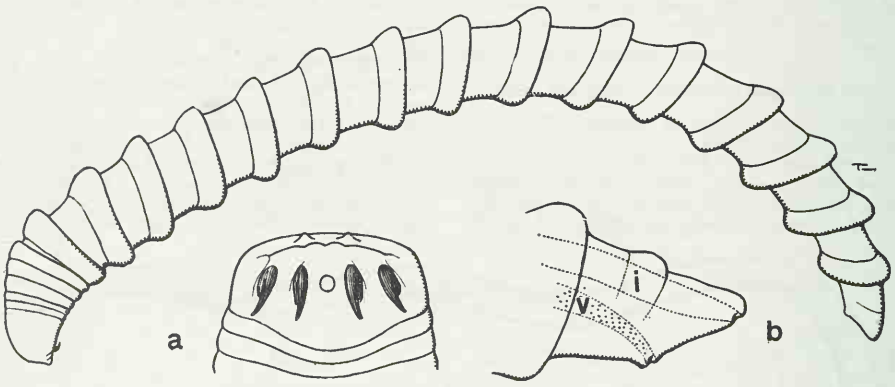
Synonyms.—*Pentastomum proboscideum* var. *coarctatum* Diesing, 1850 (in part); *Porocephalus pattoni* Stephens, 1908.

Specific diagnosis.—*Kiricephalus:* Largest female specimens, length: 80 to 115 mm., width: 2·5 mm. Annuli c. 36. Body cylindrical, ends bluntly, and posterior end exhibits some torsion. Mouth has the outline of a horse-collar. Eggs, taken from uterus measure, 80 by 70 microns.

Hosts.—According to Captain Patton (1909) this linguatulid is very common in the lungs of *Zamenis mucosus*, where it is often found in large numbers. Lamare-Piquot (1835) found it in the lungs of the rings have disappeared, at the same time the body has become curiously twisted, and this characteristic feature has suggested the specific name which I have given this form. The cephalothorax, which includes the first three or four rings, is well marked off from the body. The rings, as the body stretches, disappear last from the region behind the well-marked neck.

"The hooks are single, the inner pair slightly in advance of the outer. The mouth almost oval and a little posterior to the inner hooks; a chitinous half-cylinder runs back from it along the posterior face of the œsophagus.

"Length of mature female, 40 mm. The longest specimen measured 3 mm. more, but the others were very constant in their length. The head measured 5 mm. The width of the body, which was very constant behind the neck, only slightly tapering towards the tail, is 2·5-3 mm. The length of the immature female, whose rings



Armillifer armillatus, showing distinctive characters of genus *Armillifer*. *a*, anterior extremity; *b*, posterior extremity; *i*, intestine; *v*, utero-vagina.

Zamenis korros. Judging from the wide range of the two species of *Zamenis* known to harbour the adult form, *Kiricephalus pattoni* is probably also widely distributed throughout the Oriental region and its transition areas. The Indian Rat Snake (*Zamenis mucosus*) inhabits Transcaspia, Afghanistan, India, and Ceylon, Burma, Southern China, Siam, the Malay Peninsula and Java. *Zamenis korros* is found in Sikkim Himalayas, Assam, Burma, Western Yunnan, Southern China, Siam, Malay Peninsula, Sumatra and Java.

Kiricephalus tortus (Shipley, 1898) Sambon, 1922.

Synonyms.—*Porocephalus tortus* Shipley, 1898.

Specific diagnosis.—"The young form is very distinctly ringed; the number of rings is about twenty-five. In the mature forms the development of the genital organs has so stretched the skin that are just disappearing, is 35 mm., and the length of the young form with well-marked rings is 10 mm., its breadth about 1 mm." (Shipley.)

Hosts.—*Dipsadomorphus irregularis*, New Britain.

Genus **Armillifer** Sambon, 1922, new genus.

Synonyms.—*Pentastoma* Diesing, 1835; *Linguatula* Wyman, 1847; *Nematoideum* Diesing, 1851; *Pentastomum* Harley, 1856; *Porocephalus* Stiles, 1893.

Generic diagnosis.—*Porocephalini:* Body cylindrical, elongate, slightly curved ventrally; terminal segment conical. Annulation strongly marked by thick, prominent bands in each segment giving the species of this genus a beaded or ringed window-pole appearance. Cephalothorax wedge-shaped, with anterior border rounded. Hooks robust, equal, simple; placed in straight or slightly arcuate line. Mouth orbicular, placed just above inner-hook line.

Anus terminal. Female genital opening on terminal segment, somewhat anterior to anus. Alimentary tube dorsal, short, straight. Utero-vaginal coils amassed beneath alimentary tube.

Three valid species described from Ethiopian and Oriental regions.

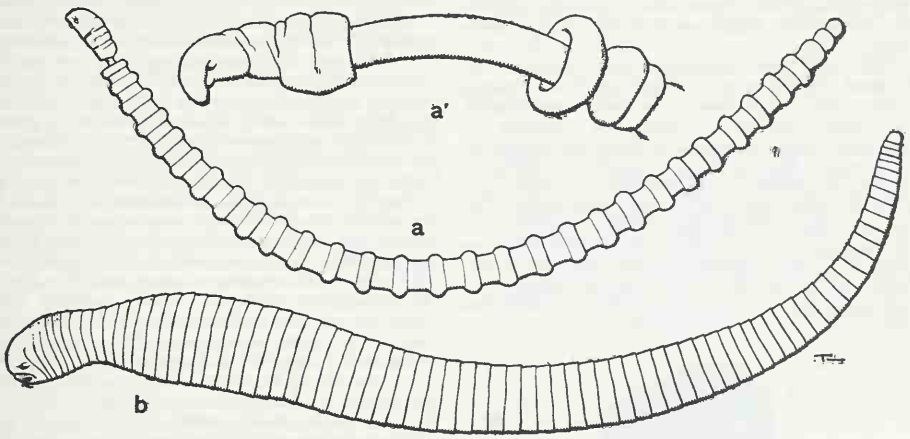
Adult forms.—Parasitic in Ophidia, nymphal forms in mammals and birds.

Type species.—*Armillifer armillatus* (Wyman, 1847) Sambon, 1922.

Armillifer armillatus (Wyman, 1847) Sambon 1922.

Synonyms. Adult form.—*Linguatula armillata* Wyman, 1847; *Pentastomum polyzonum* Harley, 1856; *Pentastomum amillatum* Leuckart, 1860 (misprint); *Pentastoma armillata* Wyman, 1863; *Pentastomum armillatum* Diesing, 1864; *Porocephalus armillatus* Stiles, 1893; *Porocephalus polyzonus* Stiles, 1893; *Porocephalus moniliformis* Neumann, 1899 (in part). *Nymphal form.*—*Linguatula diesingii* Van Beneden, 1849; *Pentastomum tornatum* Creplin, 1849 (in part); *Pentastomum euryzonum* Diesing, 1850; *Nematoideum hominis* (viscerum) Diesing, 1851; *Pentastomum constrictum* Von Siebold, 1852; *Linguatula constricta* Küchenmeister, 1855; *Pentastoma leonis* Wedl, 1863; *Pentastomum leonis* Diesing, 1864; *Pentastoma tornatum* Cobbold, 1879; *Pentastomum protelis* Hoyle, 1883; *Porocephalus constrictus* Stiles, 1893; *Linguatula constrictor* Galli Valerio, 1896 (misprint); *Pentastomum diesingii* Shipley, 1898.

Specific diagnosis.—*Armillifer:* Body elongate, more or less cylindrical in the anterior half, gradually tapering posteriorly, and terminating in a blunt-pointed cone; slightly curved ventrally; ivory-white in preserved specimens, of a bright lemon yellow tint during life. Adult females 90 to 130 mm. long by 5 to 9 mm. broad; males 30 to 45 mm. long by 3 to 4 mm. broad. Body encircled by prominent, opaque, bracelet-like rings, placed at intervals and somewhat obliquely, which give it the peculiar appearance of a screw-nail. The encirclets number sixteen to twenty-six in the males, eighteen to twenty-three in the females; they measure 1 to 2 mm. in breadth, and are separated by nearly transparent interannular spaces 2 to 5 mm. wide, except between the foremost anterior rings, which are narrower, closely approximated, and only faintly indicated by shallow linear furrows. There is no sharp distinction between cephalothorax and abdomen, and the encirclets nearest the cephalothorax are sometimes so indistinct that it is almost impossible to make out their actual number. The cephalothorax is somewhat wedge-shaped, sloping frontwards; its dorsal surface is convex, the ventral one flat or more or less concave. The anterior edge of the cephalothorax is rounded, its base is limited by the first body ring. In length it varies between 3 and 4 mm. in female specimens; 1·5 and 2·5 mm. in male specimens; in breadth, between 4 and 7 mm. in females; 3·5 and 5 mm. in males. On its ventral surface open the mouth and four symmetrically placed hook-pits, each containing a single claw-like hooklet. The mouth is orbicular and lipped by a chitinous armature which, in the largest specimens, measures 0·16 mm. in diameter. It is situated on the middle line at about 1 mm. from the anterior border. The hook-pouches are placed on a line with the mouth, two on either side. The hooks are all of the same size and shape, each consisting of a robust, strongly curved



a, Armillifer annulatus; a', anterior constricted extremity of *A. annulatus; b, Waddycephalus teretiusculus.*

chitinous process about 1 mm. in length. They are hollow, transparent, and of a bright amber-yellow colour. Two prominent antenniform papillæ are placed on the anterior border, one above each inner hook-pit; other smaller papillæ, not always distinctly visible, are situated below the inner hook-pits, above and below the outer hook-pits, and at the back and sides of the cephalothorax. The anus lies at the posterior end of the terminal cone. In the female, the vagina opens on the mid-ventral surface of this cone, at about 2 mm. from the posterior end. The sexual opening of the male, common to the two copulatory organs, lies at the anterior end of the body on the first encirclet in the mid-ventral line. Through the thin body-wall, at the inter-annular spaces, may be seen, by transparency, the alimentary canal, which runs in an almost perfectly straight line from mouth to anus, and, in the female, the closely packed coils of the utero-vaginal tube.

The eggs are elliptical, double-shelled, and measure 108 microns in length by 80 microns in width; they are enclosed in a transparent, liquid-containing, circular bladder 144 microns in diameter, which represents a third and outer egg-membrane. The acariform embryo measures 92 microns in length by 72 microns in width; it is provided with four ambulatory appendages, two on each side, each one tipped with a pair of claws 10 microns long. It presents a perforating apparatus at the rounded anterior extremity of the body well above the mouth, and a tapering and terminally-spined tail-process 50 microns long folded beneath the ventral surface.

Encysted nymph of *Armillifer armillatus*.

The encysted nymphal form entirely resembles the adult form, but varies considerably in size according to the stage of development. It is invariably found closely coiled into a more or less complete circle with the ventral surface usually forming the convexity of the curve.

Hosts. Adult form.—West African Python (*Python sebæ*), Royal Python (*Python regius*), Puff-Adder (*Bitis arietans*), Gaboon Puff-Adder (*Bitis gabonica*), Rhinoceros Adder (*Bitis nasicornis*), and the Horned Viper or Asp (*Cerastes cornutus*). *Nymphal form.*—Man (*Homo sapiens*), Chimpanzee (*Anthropopithecus troglodytes*), Sykes's Guenon (*Cercopithecus albigularis*), Pousargue's Guenon (*Cercopithecus pousarguei*), *Cercopithecus engythithia*, Sooty Mangabey (*Cercocebus fuliginosus*), *Macacus* sp., Chacma Baboon (*Papio porcarius*), Mandrill (*Papio maimon*), Guinea Baboon (*Papio sphinx*), Bosman's Potto (*Perodicticus potto*), African Hedgehog (*Erinaceus æthiopicus*), Lion (*Felis leo*), *Felis* sp., Kusimanse (*Crossarchus obscurus*), Banded Ichneumon (*Crossarchus fasciatus*), Aard-Wolf (*Proteles cristatus*), Domestic Dog (*Canis familiaris*), Black Rat (*Mus rattus*), Gambian Pouched Rat (*Cricetomys gambianus*), South African Reed-buck (*Cervicapra arundinum*), Harnessed Antelope (*Tragelaphus scriptus*), and the Giraffe (*Giraffa camelopardalis*).

Armillifer moniliformis (Diesing, 1835) Stiles, 1893.

Synonyms. Adult form.—*Pentastoma moniliforme* Diesing, 1835; *Pentastomum moniliforme* Leuckart, 1860; *Linguatula moniliforme* Mégnin, 1880; *Porocephalus moniliformis* Stiles, 1893. *Nymphal form.*—*Pentastoma tornatum* Creplin, 1849 (in part); *Pentastoma aonycis* Macalister 1874; *Porocephalus armillatus* Stiles, 1908 (in part).

Specific diagnosis.—*Armillifer moniliformis* is so strikingly like *A. armillatus* in general appearance and structure that, at first sight, it may be mistaken easily for the latter. However, it is more slender in build, tapers more decidedly caudad, and has a greater number of annulations which present a bead-like appearance never seen in specimens of *A. armillatus*. The most important difference, the only one by which it can be possible at once and certainly to distinguish the species, is that of the number of rings which are never more than twenty-six in the males and twenty-three in the females of *Armillifer armillatus*, whilst in *A. moniliformis* the males have twenty-six rings and the females twenty-eight to thirty-five. Like *Armillifer armillatus*, so also *A. moniliformis* is of a bright yellow colour in fresh specimens. The largest male specimens I have had the opportunity of examining were sent me by Dr. Ouwens; they measure 25 mm. in length by 2·5 mm. in maximum width. The genital opening of the male is situated in the mid-ventral surface of the first body ring. The adult females, of which I have examined several specimens, measure from 70 to 90 mm. in length by 4 to 7 mm. in maximum width. The largest specimen was one collected by Dr. Ouwens in Java from the lung of *Python molurus;* it measured 91 mm. in length by 7 mm. in maximum width. The female sexual opening is placed on the mid-ventral surface of the terminal body cone at about 1 mm. from the anus, which opens at the apex of the cone.

Hosts. Adult form.—Indian Python (*Python molurus*), Reticulated Python (*Python reticulatus*). *Nymphal form.*—Man (*Homo sapiens*), Macaque Monkey (*Macacus cynomolgus*), Rhesus Monkey (*Macacus rhesus*), a Sumatran monkey of undetermined species, Tiger (*Felis tigris*), Leopard (*Felis pardus*), Indian Civet (*Viverricula malaccensis*). Domestic Dog (*Canis familiaris*), Indian Otter (*Lutra nair*).

Armillifer annulatus (Baird, 1853) Sambon, 1922.

Synonyms.—*Pentastoma annulatum* Baird, 1853; *Pentastoma multicinctum* Harley, 1857; *Pentastomum annulosum* Stiles, 1891 (misprint); *Poro-*

cephalus annulatus Shipley, 1898; *Porocephalus pomeroyi* Woodland, 1920.

Specific diagnosis.—Armillifer: Body elongate, adult female, 80 to 120 mm. long by 4 mm. in maximum width; male, 25 to 29 mm. long by 2 mm. broad. Cephalothorax wedge-shaped, 5 mm. long by 4 mm. in maximum width, anterior border rounded, posterior surface presents two or three grooves simulating as many rings. Hooks simple, equal. Mouth small, almost circular, in a line with hooks. The cephalothorax is followed by a very narrow neck-like constriction, the length of which may vary considerably from less than one to three or more millimetres. The first body ring following immediately upon the constriction is broader than the rest and usually greatly deformed. There can be no doubt that this constriction is, as in the case of other linguatulids which insert their cephalothorax deeply into the host's tissues, a result of constriction, which may at times so completely garrotte the parasite as to prevent normal growth and finally mortify the constricted part. The normal body rings measure about 3 mm. in anterior part, then gradually increase in size until they reach a diameter of 4 mm., about the middle of the body, to decrease as gradually caudad until the terminal segment is reached, which measures again 3 mm. The rings measure slightly more than 1 mm. in width, and the largest project considerably from the surface of the body; they are separated by spaces varying from about 2 mm. in the middle part of the body to about 1 mm. at either extremity. The posterior end beyond the last ring is conical in shape, and measures 1·8 mm. in length by 1·6 mm. in width. It is notched at its apex. The female sexual opening is just in front of the anus.

Hosts. Adult form.—Egyptian Cobra (*Naia haje*), Black Cobra (*Naia nigricollis*), Gaboon Puff-Adder (*Bitis gabonica*), Rhinoceros Viper (*Bitis nasicornis*). *Nymphal form.*—Lohrmann (1889) ascribes to this species a nymphal linguatulid which he found encysted in a Water-Hen (*Porphyrio*), but he gives no description of the parasite, does not indicate its anatomical habitat, and gives neither species nor locality of host. If his determination be correct, probably the host is either the Grey-headed Gallinule (*Porphyrio porphyrio*) or the Purple Water-Hen (*Porphyrio cæruleus*), both of which occur within its range.

Sir Arthur Shipley (1898) mentions some specimens "with twenty-six rings, not counting the tail," collected from a Demoiselle Crane (*Anthropoides virgo*) and preserved in the collection of the Natural History Museum, Paris. I have looked for these specimens, but found one only. It is a male linguatulid presenting not twenty-six, but twenty-nine rings, yet it must be one of those examined by Shipley, since the label bears the following inscription: "*Grue de Numidie, Ménagerie*, 1880." Its size, shape, annulation, circular mouth, simple hooks and notched posterior extremity well coincide with the known characters of *Armillifer annulatus;* it is, therefore, quite possiblo that the linguatulid found in the Demoiselle Crane of the Paris Menagerie belongs to this species.

Genus **Waddycephalus** Sambon, 1922.

Synonyms.—Pentastoma Baird, 1862; *Pentastomum* Spencer, 1898; *Porocephalus* Shipley, 1898.

Generic diagnosis.—Porocephalini: Body club-shaped (like Australian "waddy"), tapering considerably towards posterior extremity, which ends in bilobed segment. Annuli smooth. Cephalothorax somewhat rounded, owing to constriction of anterior body segments. Hooks simple, unequal, inner larger, outer smaller, placed in arcuate line, the outer not only above the inner, but somewhat laterally. Mouth cordate, placed on inner hook-line. Anus between terminal lobes. Female genital opening considerably anterior to anus, placed on eighth body ring in *W. teretiusculus*. Alimentary canal axial, coils of utero-vagina amassed beneath alimentaary canal.

One species only described by Baird in 1860, and again more fully by Spencer in 1893. Found in Australian snakes.

Waddycephalus (Baird, 1862), Sambon, 1922.

Synonyms.—Pentastoma teretiusculum Baird, 1862; *Pentastomum teretiusculum* Spencer, 1893; *Porocephalus teretiusculus* Shipley, 1898.

Specific diagnosis.—Body of a bright red colour (in fresh specimens), straight, cylindrical, annulated, tapering considerably towards the posterior extremity. Cephalothorax bluntly rounded anteriorly. Mouth prominent, cordate, with apex pointing forwards; base of oral opening on a line with posterior extremity of inner hook-pits. Hooks simple, inner ones somewhat larger, outer ones placed slightly above the inner ones and laterally. Terminal body-segment bilobed. Anal opening between the lobes.

Adult female about 60 mm. in length by 5 mm. in maximum width. Broadest part at about the junction of the anterior with the middle third. Annuli, according to Spencer, from 65-70. In Baird's specimen, which is in the British Museum, I count seventy-six. Sexual orifice crescentic, and situated on mid-ventral surface of eighth ring from the posterior extremity.

"Adult male about 13 mm. in length by 2 mm. in maximum width. Broadest part just behind posterior margin of cephalothorax. Annuli about 88, the number varying only within one or two of this. Sexual orifice oval and placed on the third and fourth annuli in the mid-ventral line, and with the long axis of the oval at right angles to that of the body." (Spencer.)

Hosts.—Found in the lungs of the following Australian snakes: *Pseudechis porphyriacus, Denisonia superba, Diemenia textilis* and *Diemenia reticulata*, and from Tiger Snake, *Notechis scutatus*. (T. H. Johnston.)

The *Linguatulini* comprise two genera: *Linguatula* and *Subtriquetra*.

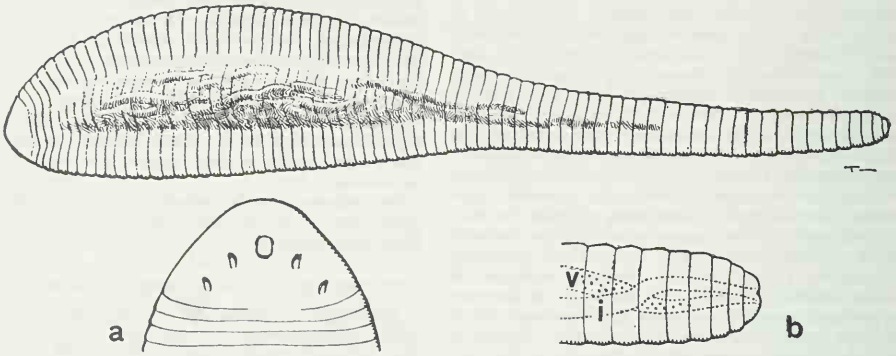
Genus **Linguatula** Frölich, 1789.

Synonyms.—Tænia Pilger, 1803; *Halysis* Zeder, 1803; *Cochlus* Rudolphi, 1805; *Prionoderma* Rudolphi, 1808; *Polystoma* Rudolphi, 1809; *Echinorhynchus* Braun, 1809; *Tetragulus* Bosc, 1810; *Linguatula* Lamarck, 1816; *Pentastoma* Rudolphi, 1819.

Generic diagnosis.—Linguatulini: Body spatulate, attenuated posteriorly. Cephalothorax anteriorly

Specific diagnosis.—Linguatula: Female, length: 80 to 130 mm.; width: 8 to 10 mm. anteriorly, 2 mm. posteriorly. Colour yellowish (in fresh specimens). Male, length: 18 to 20 mm.; width: 3 to 4 mm. anteriorly, 0·5 mm. posteriorly. Annuli c. 90. Eggs: 90 by 70 microns. Nymphal form provided with single rows of minute spines (c. 36 microns long), placed at posterior margin of annuli.

Hosts.—Adult form.—Man (*Homo sapiens*),



Linguatula serrata, showing distinctive characters of genus *Linguatula*. *a*, anterior extremity; *b*, posterior extremity; *i*, intestine; *v*, utero-vagina.

obtuse. Mouth subterminal, squarish, situated between inner hooks. Hooks simple, equal, disposed archwise. Alimentary canal straight. Anus terminal. Uterus anteriorly twined round alimentary tube. Parasitic in mammals.

Type species.—Linguatula serrata Frölich, 1789.

Linguatula serrata Frölich, 1789.

Synonyms.—Adult form.—Ténia lanceolé Chabert, 1787; *Ver rhinaire* Chabert, 1787; *Tænia rhinaris* Pilger, 1803; *Tænia lanceolata* Rudolphi, 1805; *Cochlus rhinarius* Rudolphi, 1805; *Prionoderma rhinarium* Rudolphi, 1808; *Polystoma tænioides* Rudolphi, 1809; *Tænia rhinaria* Rudolphi, 1810; *Linguatula tænioides* Lamarck, 1816; *Prionoderma lanceolata* Cuvier, 1817; *Pentastoma tænioides* Rudolphi, 1819; *Linguatula lanceolata* de Blainville, 1828; *Linguatula rhinaria* Raillet, 1900. *Nymphal form.—Linguatula serrata* Frölich, 1789; *Tænia capræa* Abildgaard, 1789; *Tænia caprina*, Gmelin, 1800; *Polystoma serratum* Goeze, 1803; *Halysis caprina* Zeder, 1803; *Linguatula denticulata* Rudolphi, 1805; *Echinorhynchus capræ* Braun, 1809; *Polystoma denticulatum* Rudolphi, 1809; *Tetragulus caviæ* Bosc, 1810; *Pentastoma denticulatum* Rudolphi, 1819; *Pentastoma serratum* Rudolphi, 1819; *Pentastoma emarginatum* Rudolphi, 1819; *Pentastoma fera* Creplin, 1829; *Pentostoma tænoides* Dick, 1840; (misprint); *Linguatula ferox* Gros, 1849; *Linguatula caprina* R. Blanchard, 1895; *Linguatula rhinaris* Raillet, 1900. Domestic Dog (*Canis familiaris*), Wolf (*Canis lupus*), Fox (*Canis vulpes*), Horse (*Equus caballus*), Ass (*Equus asino-caballus*), Sheep (*Ovis aries*), Goat (*Capra hircus*). Shipley in his list of hosts for this species mentions the Jaguar (*Felis onca*), but this is probably a mistake, because he retains the species *L. recurvata* Diesing found in the frontal sinuses and trachea of *Felis onca*. *Nymphal form.*—Man (*Homo sapiens*), Long-eared Hedgehog (*Erinaceus auritus*), Cat (*Felis catus*), Black Rat (*Mus rattus*), Brown Rat (*Mus norvegicus*), Crested Porcupine (*Hystrix cristata*), Cavy (*Cavia cutleri*), Common Hare (*Lepus europæus*), Common Rabbit (*Lepus cuniculus*), Horse (*Equus caballus*), Ass (*Equus asino-caballus*), Bull (*Bos taurus*), Domesticated Goat (*Capra hircus*), Sheep (*Ovis aries*), Pronghorn Antelope (*Antilocapra americana*), South African Blue Duiker (*Cephalophus monticola*), Bubal Antelope (*Bubalis boselaphus*), Roebuck (*Capreolus capreolus*), European Fallow-Deer (*Dama dama*), Arabian Camel (*Camelus dromedarius*), Domestic Pig (*Sus scrofa domesticus*), and Collared Peccary (*Dicotyles tajacu*).

Linguatula recurvata (Diesing, 1850) Raillet, 1883.

Synonyms.—Pentastomum recurvatum Diesing, 1850; *Linguatula recurvata* Raillet, 1883.

Specific diagnosis.—Linguatula: Body spatulate, attenuated posteriorly, ventral surface flattened, dorsal convex, sides depressed, crenated. Annuli,

100-109. Anterior extremity truncated; posterior end bifid and curved dorsally. Length of female: 13-27 mm.; width, anteriorly: 4 mm.; posteriorly: 1·5 mm. Male: 3 to 4 mm. long, 3 to ½ mm. broad. Mouth elliptical, hooks simple, disposed archwise. Anus opens between caudal lobes. Male genital opening on 7th body ring.

Hosts.—Found by Natterer in frontal sinuses and trachea of a Jaguar (*Felis onca*).

Genus **Subtriquetra** Sambon, 1922, new genus.

Synonyms.—*Pentastoma* Bresmer, 1824; *Pentastomum* Diesing, 1850; *Linguatula* Railliet, 1883.

Generic diagnosis.—*Linguatulini*: Body more or less elliptical, flattened ventrally, greatly prominent dorsally. *Adult form.*—Parasitic in crocodilians. *Nymphal form* in fish.

Type species.—*Subtriquetra subtriquetra* (Diesing, 1835) Sambon, 1922.

Subtriquetra subtriquetra (Diesing, 1835) Sambon 1922.

Synonyms.—*Pentastoma proboscideum* Bresmer, 1824 (in part); *Pentastoma subtriquetrum* Diesing, 1835; *Pentastomum subtriquetrum* Diesing, 1850; *Pentastomum pusillum* Diesing, 1856; *Linguatula subtriquetra* Raillet, 1883; *Linguatula pusilla* Shipley, 1898.

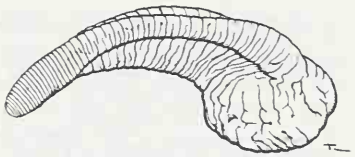
Specific diagnosis.—Body elliptical or of oblong-ovoidal figure with the posterior part narrower; ventral surface flattened, dorsal convex. Annuli, 30 and over. Anterior end of cephalothorax truncated. Mouth orbicular. Hooks simple, equal, disposed archwise. Length of female 22·5 mm., width 6·7 mm.

Hosts. Adult form.—Found by Bresmer (1824), Diesing and Prof. Fisher (1835) in mouth cavity of Common Caiman (*Caiman sclerops*) and by Natterer in Black or Great Caiman (*Caiman niger*). *Nymphal form.*—Found by Natterer in the intestine of a female *Acara coscudo*, a Neotropical fish of the family *Chromides*.

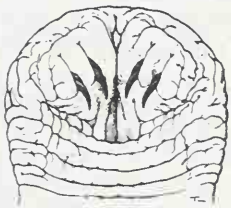
Subtriquetra megacephala (Baird, 1853) Sambon, 1922.

Synonyms.—*Pentastoma megacephalum* Baird, 1853; *Porocephalus megacephalus* Shipley, 1898.

Specific diagnosis.—This linguatulid was first described by Dr. William Baird (1853) from specimens presented to the British Museum by Mr. W. Masters, who found them "embedded in the flesh of the head of a Sunderbunds crocodile (*Crocodilus palustris*) from India." In 1898, Sir Arthur Shipley re-examined Baird's specimens, found the mouth to be squarish in shape, and counted from forty to fifty annulations. In 1907 I just glanced at the only specimen then left, but my artist, Mr. Terzi, delineated it carefully, and his drawing is here reproduced (see illustration). Quite recently, through the courtesy of Mr. Stanley Hirst, again I have been able to examine the collection of linguatulids in the British Museum, but this particular species could not be found. Baird's largest specimen, a female, measured 20 mm. in length by 10 mm. in width at the anterior extremity. Its posterior end was about 8 mm. broad. The body shape was altered by injury at the posterior end, from which extruded some of the utero-vaginal coils. The whole specimen was in consequence greatly puckered. The anterior extremity was large, thick, club-shaped, the ventral surface somewhat flattened, the dorsal rounded and very prominent in the middle, depressed at the edges. The annulation was indistinct and confused by lines of puckering, but there seemed to be about fifty rings, as noticed by Shipley. The mouth was deeply embedded and hardly visible. The hooks were large, strong, and provided with accessory spines. This binate condition of the hooks had escaped both Baird and



Anterior extremity of *Subtriquetra megacephala*.



Cephalothorax of *Subtriquetra megacephala*.

Shipley, but was noticed by Terzi, and is clearly shown in his excellent drawing.

Hosts.—The Muggar or Indian Marsh Crocodile (*Crocodilus palustris*).

Quite recently, under the name of *Linguatula subtriquetra*, Sir Arthur Shipley has mentioned an Oriental linguatulid from a crocodile shot on the Hugli River (Bengal). Unfortunately, the following is all the information given: "As far as I am aware, *Linguatula subtriquetra* has not hitherto been recorded from the Eastern Hemisphere, but the specimen in the Indian Museum was taken from the pharynx of a crocodile captured at Sangor on the mouth of the river Hoogly. This species has never been adequately illustrated, so I have added some figures which, owing to the skill of Mr. E Wilson, justly represent the characteristic appearances of this Pentastomid. These figures show that there are four papillæ in front of the

mouth and two behind it, and emphasize the importance of the lateral flaps or flanges." The "Sangor Crocodile" may have been either the esturine Gharial (*Gavialis gangeticus*) or the Swamp Crocodile (*Crocodilus palustris*) and the Linguatulid, possibly a better specimen of *Subtriquetra megacephala*. It is a pity that it was not examined more carefully. Zoogeographical reasons demanded it. *Subtriquetra subtriquetra* is a Neotropical species far removed from the western coast of India.

(To be continued.)

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Observations on Bacillus botulinus Infection of Canned Spinach (S. A. Koser, R. B. Edmondson, and L. T. Giltner, *Journal of the American Medical Association,* vol. lxxvii, No. 16, October, 1921).—*Bacillus botulinus,* Type A, is able to multiply and produce its characteristic toxin in canned spinach, although the development of the organism in this food product was found to be somewhat irregular. In some instances there was evidence of a rapid multiplication, while in others there was apparently neither growth nor toxin formation. In all of the latter cases, however, the organism was found to be viable.

A temperature of 37° C., as contrasted with room temperature, accelerated the development to a certain extent.

When multiplication had progressed readily, 0·5 c.c. of the spinach juice *per os* proved sufficient to kill guinea-pigs, usually in eighteen hours.

The growth of *B. botulinus* in canned spinach is accompanied by the evolution of gas as well as by the elaboration of the specific toxin. In only one instance had toxin formation advanced to such a stage as to produce a fatal result, while at the same time gas production either had not occurred or was insufficient to cause bulging of the can.

Of 174 samples of canned spinach taken from suspected lots, *B. botulinus* or its toxin was found in six. In every case the organism was of the A type. These six toxic cans were all "hard swells," and when opened the odour was distinctly offensive.

The destruction of foodstuffs deemed to be abnormal, either by appearance of the containers or by the odour, should prevent the greater number of the outbreaks of botulism. From the public health aspect of the problem, the last point is of especial importance.

The Cultivation and Cyst Formation of Waskia intestinalis (Mary J. Hogue, *Journal of the American Medical Association,* vol. lxxvii, No. 2, July, 1921).—The author describes an experiment to cultivate the organism of *Waskia intestinalis* from the stool of a patient in the United States suffering from persistent diarrhœa. The organism was obtained in its free and encysted forms. The media, ovomucoid, ox-bile salt, and Locke egg, &c., are also described.

Studies in the Value of the Wassermann Test, No. IV. Significance and Value of a Positive Wassermann Reaction in Tuberculosis (Capt. K. R. K. Iyengar, M.B., I.M.S., *Indian Journal of Medical Research,* vol. ix, No. 2, October, 1921). In view of the fact that an unselected, apparently healthy, Indian male adult population gives a positive Wassermann reaction in eighty-eight cases out of 400, or 22 per cent., it is inferred that a figure of not more than 20 per cent. occurring in an unselected Indian male adult population suffering from tuberculosis must be due to the existence in this population of latent or clinically inactive syphilis. It is concluded that tuberculosis is not a cause of positive Wassermann reaction.

Intravenous Injections of Antimony Tartrate in Treatment of Bilharziasis (H. K. Pavy, *Medical Journal of Australia,* July, 1921).—The author treated ten cases of bilharziasis with intravenous injections of tartar emetic. No other form of treatment was administered, and the patients were neither dieted nor confined to bed. The solution used consisted of 0·06 grm. tartar emetic dissolved in 5 c.c. physiologic solution of sodium chloride, which was injected into a suitable vein well below the elbow-joint. The initial dose in all cases was 2·5 c.c. of the solution (¼ gr. tartar emetic). Patients showing a good tolerance for the drug were worked up to 10 c.c. (2 gr.) in four to six injections, others had to be worked up more gradually. Injections were given every day at first and later on three times a week. No local effects followed the injections, and the same vein could be used repeatedly.

Original Communications.

DANGERS OF RAPID INTRAVENOUS INJECTION OF CONCENTRATED SOLUTIONS OF QUININE BIHYDROCHLOR.

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In a paper read at the Medical Section of the Asiatic Society of Bengal on blood-pressure during intravenous injection of quinine on October 13, 1920, and published in the *Indian Medical Gazette* in December, 1920, I pointed out that there may be a dangerous fall of blood-pressure after injection of concentrated solution of quinine.

Since then I have made further observation and have confirmed my former conclusions. I consider that there may be a dangerous fall of blood-pressure during rapid intravenous injection of solution of quinine bihydrochlor. The whole problem depends upon the amount of quinine passing through the heart every second, and therefore the slower the injection, the less is the chance for profound fall of blood-pressure. Besides, if the rate of injection of the diluting fluid be the same, more quantity of quinine bihydrochlor. will be passing through the heart every second if the solution is concentrated than when it is dilute. Some observers have pointed out that intravenous injection of large quantities of saline, such as a pint, may prove too much for a weak heart, and the question of greatly diluted versus concentrated solution of quinine at once arises. The problem divides itself into the following parts:—

(1) How much saline may be safely injected into a severe case of malaria, where the patient's blood-pressure is low, say 60 or 70, or when he is absolutely collapsed?

(2) Is there any advantage or disadvantage in diluting the quinine solution beyond a certain limit?

(3) Is there any danger in using the drug in a concentrated solution, using, say, as recommended by Thomson, a dose of 15 gr. of quinine bihydrochlor. in 5 c.c. and completing the injection in 75 to 100 seconds?

In my opinion, the amount of quinine injected into a vein at the bend of the elbow should not be more than 1/120 gr. per second or ½ gr. per minute. This will mean that 10 gr. will take twenty minutes for completion of the injection. If one uses a dilution of 1 in 300, this will mean that 10 c.c. will take one minute for injection, and the total amount of fluid injected will be 200 c.c. Injection of fluid beyond this limit into a patient whose blood-pressure is very low is likely to cause pulmonary œdema, which may prove very serious in certain cases of pernicious malaria. A dilution less than that may make it very difficult to inject at the rate of 1/120 gr. of quinine per second.

The danger of injecting saline in large quantities was illustrated in a case of pernicious malaria in a collapsed state, in whom an injection of a pint of normal saline was followed by a very marked pulmonary œdema. I cannot, therefore, recommend dilution of 15 gr. of quinine bihydrochlor. in 4 to 6 pints, as has been recommended by some authorities, which would mean a dilution of 1 in 3,000 to 1 in 4,000.

In my opinion, injection of quinine bihydrochlor. in strength of 15 gr. dissolved in 5 c.c. given in one and a half to two minutes is dangerous, although it is recommended by others to be a safe procedure. This would mean injecting 1/24 gr. per second, and in my opinion that may prove dangerous.

In a few cases I made observations on the systolic, diastolic and pulse-pressures, and in some I found that while the systolic pressure would tend to fall, the diastolic pressure would tend to rise, making the pulse-pressure lower than before, which would be very dangerous to circulation if the systolic pressure is already very low. I have also observed that the more concentrated the solution, the greater is the change of the pulse-pressure being lowered, and sometimes there is a marked irregularity in the systolic blood-pressure for some seconds after the injection has been given, pointing, as it were, to the conclusion that the systolic output of the heart is irregular for a few seconds after the injection.

These changes of blood-pressure are all important factors in the operation of intravenous injection of quinine, and are more likely to take place the more concentrated the solution.

It may be argued that a concentrated solution may be injected very slowly, and so there may be no need of diluting the solution. As pointed out before, to inject 10 gr. dissolved in 200 c.c. in twenty minutes would require one minute for each 10 c.c., it would, therefore, be necessary to inject the solution still more slowly if one uses a concentrated solution and intends to inject the same quantity of quinine bihydrochlor. per second. Thus for a solution of 10 gr. in 100 c.c. one must inject 5 c.c. in not less than one minute, and the stronger the solution, the slower must be the rate of flow and the more difficult to regulate the rate of flow. Concentrated solution of 20 per cent., or 15 gr. in 5 c.c. as has been recommended by some authorities, would mean that one must inject 5 c.c. in thirty minutes. It is evident that this is hardly practicable. For the purpose of regulating the flow very accurately, I have devised a specially fine needle with which one can easily regulate the flow at the rate of 10 c.c. of saline per minute.

I have observed that the use of Bayliss's solution in place of normal saline does not tend to diminish the tendency towards fall of blood-pressure after injection of concentrated solution of quinine.

From what I have stated above, it is evident that the rate of injection should be still slower in the case of children because, if in the adult the limit should be 1/120 gr. of quinine bihydrochlor., in the case of children this should be still less. I would suggest that 5 gr. should be injected in patients below 15 years of age in twenty minutes, which is half the rate in the case of an adult.

The fall of blood-pressure after intravenous injection of quinine may take place in two stages.

(1) Fall that may take place immediately after injection.

(2) Fall which may come on some minutes after injection has been completed and when the quinine has been well diluted in the circulation.

The former may prove rapidly fatal, the latter may happen, whatever may be the dilution of the quinine used. To guard against them I would advise that in all cases of malarial fever in which the blood-pressure is low, as is frequently the case with the pernicious type of the disease, intravenous injection of quinine bihydrochlor. should be given, guarded with injection of pituitrin or adrenalin. Whatever may be the advantages of a 10 c.c. syringe, and however simple and quick, the procedure may be in injecting a concentrated solution of quinine with such a syringe, I consider that a concentrated solution of quinine should never be rapidly injected intravenously, and as it may be impracticable to inject a concentrated solution very slowly, one should always use a dilute solution of the strength recommended by me.

In the accompanying tables are shown the effects on systolic, diastolic and pulse-pressures after intravenous injections of dilute solutions of quinine bihydrochlor. It will be observed that the injections were given more or less slowly. Still, in some cases there was a tendency towards fall of systolic and rise of diastolic pressures, but there was never such profound fall of blood-pressure as may follow infravenous injection of a concentrated solution of quinine bihydrochlor., as I have already shown in my previous paper (*Indian Medical Gazette*, December 12, 1920).

10 *gr. of Quinine Bihydrochlor. dissolved in* 200 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	110	80	30
(1)	20 sec.	30 c.c.	110	85	25
(2)	25 ,,	30 ,,	105	85	20
(3)	20 ,,	30 ,,	104	85	19
(4)	15 ,,	30 ,,	104	85	19
(5)	25 ,,	30 ,,	102	85	17
(6)	50 ,,	50 ,,	104	84	20
5 minutes after completion of injection			104	80	24
15 ,,	,,	,,	104	80	24
22 ,,	,,	,,	104	80	24
9 hours	,,	,,	96	74	22

10 *gr. of Quinine Bihydrochlor. dissolved in* 200 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before iujection	...	...	105	83	22
(1)	32 sec.	30 c.c.	105	84	21
(2)	25 ,,	30 ,,	105	85	20
(3)	30 ,,	30 ,,	104	85	19
(4)	25 ,,	30 ,,	104	85	19
(5)	25 ,,	30 ,,	103	86	17
(6)	35 ,,	50 ,,	103	84	19
5 minutes after completion of injection			103	83	20
10 ,,	,,	,,	104	86	18
14 ,,	,,	,,	104	82	22
24 ,,	,,	,,	103	84	19
8½ hours	,,	,,	99	75	22

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	110	75	35
(1)	1 min. 40 sec.	30 c.c.	105	78	27
(2)	1 min. 4 sec.	40 ,,	100	80	20
(3)	1 min. 25 sec.	30 ,,	101	78	23
5 minutes after completion of injection			105	85	20
10 ,,	,,	,,	105	85	20
23 ,,	,,	,,	105	84	21
30 ,,	,,	,,	105	84	21
9 hours	,,	,,	95	75	20

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	115	80	35
(1)	50 sec.	30 c.c.	115	85	30
(2)	45 ,,	40 ,,	110	85	25
(3)	65 ,,	30 ,,	110	85	25
5 minutes after completion of injection			110	86	24
10 ,,	,,	,,	110	85	25
15 ,,	,,	,,	105	85	20
20 ,,	,,	,,	107	85	22
25 ,,	,,	,,	105	84	21
11 hours	,,	,,	105	64	41

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	95	55	40
(1)	1 min. 45 sec.	55 c.c.	92	58	34
(2)	2 min. 15 sec.	50 ,,	95	55	40
2 minutes after completion of injection			90	60	30
5 ,,	,,	,,	93	59	34
12 ,,	,,	,,	92	59	33
7 hours	,,	,,	95	61	34

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of Normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	88	55	33
(1)	1 min. 15 sec.	50 c.c.	88	58	30
(2)	1 min. 20 sec.	50 ,,	85	55	31
4 minutes after completion of injection			85	58	27
7 ,,	,,	,,	82	60	22
12 ,,	,,	,,	82	59	23
9 hours	,,	,,	88	56	32

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	95	60	35
(1)	1 min. 60 sec.	40 c.c.	90	60	30
(2)	1 min. 5 sec.	40 ,,	90	63	27
(3)	1 min. 5 sec.	20 ,,	88	60	28
5 minutes after completion of injection			82	60	22
20 ,,	,,	,,	85	63	22
10 hours	,,	,,	95	60	35

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	85	55	30
(1)	25 sec.	10 c.c.	85	56	29
(2)	25 ,,	,,	85	55	30
(3)	20 ,,	,,	85	58	27
(4)	50 ,,	30 c.c.	80	59	21
(5)	55 ,,	,,	84	60	24
(6)	50 ,,	10 c.c.	Not taken		
5 minutes after completion of injection			84	60	24
10 ,, ,, ,,		,,	83	60	23

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	94	56	38
(1)	45 sec.	10 c.c.	94	56	38
(2)	35 ,,	10 ,,	94	58	32
(3)	30 ,,	10 ,,	90	58	32
(4)	45 ,,	10 ,,	90	60	30
(5)	30 ,,	10 ,,	90	58	32
(6)	25 ,,	10 ,,	90	58	32
(7)	10 ,,	10 ,,	90	58	32
(8)	10 ,,	10 ,,	90	57	33
(9)	25 ,,	20 ,,	90	60	30
15 minutes after completion of injection			87	58	29
20 ,, ,, ,,		,,	85	56	29

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic	Diastolic	Pulse pressure
Before injection	...	...	85	65	20
(1)	45 sec.	10 c.c.	85	65	20
(2)	40 ,,	,,	85	65	20
(3)	40 ,,	,,	85	68	17
(4)	38 ,,	,,	85	65	20
(5)	35 ,,	,,	82	65	17
(6)	30 ,,	,,	80	65	15
(7)	25 ,,	,,	85	67	18
(8)	30 ,,	,,	85	65	20
(9)	40 ,,	20 c.c.	85	65	20
12 minutes after completion of injection			85	65	20

5 *gr. of Quinine Bihydrochlor. dissolved in* 100 *c.c. of normal Saline.*

	Duration of each injection	Quantity of fluid injected each time	Systolic pressure	Diastolic pressure	Pulse pressure
Before injection	...	...	95	65	30
(1)	40 sec.	10 c.c.	95	65	30
(2)	30 ,,	,,	95	67	28
(3)	40 ,,	,,	95	70	25
(4)	45 ,,	,,	95	68	27
(5)	35 ,,	,,	95	70	25
(6)	25 ,,	,,	95	68	27
(7)	35 ,,	,,	95	70	25
(8)	35 ,,	,,	95	65	30
(9)	32 ,,	,,	95	72	25
(10)	40 ,,	,,	90	65	25
4 minutes after completion of injection			92	65	27
9 ,, ,, ,,		,,	90	70	20

PERFORATION OF THE ILEUM PROBABLY CAUSED BY *ASCARIS LUMBRICOIDES*.

By A. Ingram, W.A.M.S.

The following case is related as much for its interest from a medico-legal point of view as for any interest it may possess from a pathological aspect.

On December 27, 1921, instructions to make an autopsy were received from the Coroner, Accra, in these terms: "Please make an examination of the body of A——, stated to have been raped yesterday and to have died as the result."

The body proved to be that of a native girl about 12 years of age. It was emaciated, but the abdomen was considerably distended. It showed no marks of bruising or injury of the external genitals, or, indeed, of any part of the head, trunk, or limbs. The hymen was absent, and the vaginal orifice readily admitted two fingers; the body of the uterus could not be felt. There was a slight purulent discharge from the vagina. Smears were made from this discharge, and subsequent microscopical examination of the smears after staining revealed an extensive flora, but no gonococci were found and no spermatozoa were recognized.

The father of the deceased girl, who appeared to identify the body, denied the occurrence of rape, stating that his daughter had been unwell for some weeks previous to her death, but latterly had improved in health. Three days, however, before she died she had become worse, complaining of abdominal pain and sickness, and upon being taxed with having exposed herself to the chance of becoming pregnant, she had admitted having repeatedly had connection with two youths, since arrested on the charge of having brought about her death through causing her to become pregnant. As a proof of the justification of this charge, the indignant parent pointed to the distended condition of his daughter's abdomen.

On opening into the peritoneal cavity gas and brown-stained sero-purulent fluid escaped. The peritoneal cavity contained about one and a half pints of this fluid and four *Ascaris lumbricoides*, of which three were dead. The lower portions of the ileum were discoloured and covered with adherent tags of fibrin; an oval perforation (see photo) was discovered about 6 ft. above the ileo-cæcal junction; the lowest 8 ft. of the ileum, the cæcum and a portion of the colon were ligatured, removed and opened. The cæcum and colon showed congestion of their mucosa, but no ulceration. The mucosa of the portion of the ileum removed showed numerous swollen Peyer's patches, several of these being ulcerated superficially. The valvulæ conniventes appeared also to be obliterated in parts. None of the ulcerated parts was of any depth, with the exception of the one which had perforated, and this perforation exhibited a peculiar punched-out appearance, there being no indication of shelving. Eight *A. lumbricoides* were turned out of this portion of the ileum when it was opened up.

The spleen was enlarged and congested but not greatly pigmented. It weighed 8 oz. The liver and kidneys showed venous congestion. The uterus measured $1\frac{1}{4}$ in. in length. The heart appeared to be normal, but the lower lobes of both lungs showed patches of broncho-pneumonia. At the inquest it was stated, in giving evidence, that death was due to peritonitis following upon perforation of the intestine occurring in a case of enteric fever, that this perforation was most probably caused by an *A. lumbricoides* pushing its way

through a weakened part of the wall of the gut, and that the girl's death could not in any way be attributed to the actions of the youths in custody. The verdict of the jury was in accordance with the medical evidence and the accused were liberated.

While there is no proof that the perforation in this case was caused by an Ascaris, the fact that the girl, according to the history given by her father, after being ill had improved in health and had suddenly become worse, and the fact that, with the exception of the single ulcer which had perforated, all the other ulcers were superficial and appeared to be healing, are suggestive that the perforation was thus caused.

Castellani and Chalmers ("Manual of Tropical Medicine," third edition, p. 553) state with regard to the pathogenicity of Ascaris "the condition of the host is also a factor in the diseases produced by these parasites, for though Ascarides may be harmless in a healthy intestine, they may perforate a typhoid or dysenteric ulcer." Further (p. 1775), they write: "The observer must, however, be careful to distinguish between the post-mortem and the ante-mortem wanderings of these worms. In the former case the worms are generally found alive."

SOME CLINICAL OBSERVATIONS OF BLACKWATER FEVER IN PAPUA, AND THEIR BEARING ON ITS ÆTIOLOGY.

By W. E. Giblin, M.B.

Government Medical Officer, Samarai, Papua.

I have been tempted to record these observations on blackwater fever as it occurs in Papua, in Europeans and half-castes, because they seem so strongly to support the conclusions stated by the Panama Canal Commission—namely, that blackwater fever only occurs when a population not immune to malaria becomes exposed to extensive infections by it, when relapse and re-infection are therefore common, and, owing to unfavourable conditions, proper quinine treatment has not always been obtainable.

A malarial element is therefore an essential contributing factor to the production of an attack of blackwater fever. Adequate quinine treatment of the antecedent malaria should therefore eliminate the possibility of a subsequent attack of blackwater fever. What other essential factor, or factors, that may be concerned in the production of the hæmolysis are at present unknown. But no malarial factor, no blackwater fever.

Quinine, exposure, fatigue, alcohol are exciting causes, and may precipitate an attack in a sensitized person. That the hæmolytic agent is more than malarial toxin is evidenced by the fact that quinine does not check the hæmolysis in any way.

In Papua blackwater fever is widespread, and corresponds pretty closely in its distribution with malaria. It is one of the chief causes of death within the territory. In my series of fourteen cases there have been two deaths. The records of these cases are by no means complete; in some instances no records have been kept and I quote from memory.

Definition.—In the present state of uncertainty as to the cause of blackwater fever, it is difficult to define the disease precisely. On account of its uncertain ætiology, Arkwright and Lepper describe the disease as a clinical syndrome. Castellani and Chalmers, however, are quite convinced that the disease is a specific entity, and define it as follows: "Blackwater fever, *sensu stricto*, is an acute

specific fever of unknown causation, and characterized by the severity of its symptoms, great blood destruction, jaundice and hæmoglobinuria."

These authors also distinguish a malarial and quinine hæmoglobinuria. It seems most probable that blackwater fever, malarial and quinine hæmoglobinurias are all one and the same disease.

If this supposition is correct, then the following statement of Castellani and Chalmers is rather unnecessary:—

"Until tropical practitioners accustom themselves to differentiate from specific blackwater fever, the hæmoglobinurias due to quinine and to malaria, no real progress will be made with the knowledge of this serious illness."

The following case indicates how pronounced the essential contributing malaria factor may appear in a case of blackwater fever.

Johnny, a missionary half-caste, aged about 12 years, came down to me on the twelfth day of his illness with the following history:—

His illness started twelve days previously with a severe chill, high temperature, vomiting, and the passing of bloody urine for three days; then his urine cleared for one day, to be followed the next day by an attack of blackwater. A very definite tertian periodicity was then established in regard to the hæmoglobinuria. The urine was the colour of claret on every alternate morning, clearing by evening. It showed the spectroscopic bands of meth-hæmoglobinuria generally; occasionally of oxy-hæmoglobin.

No rigor accompanied the appearance of the hæmoglobinuria. His temperature throughout his illness was of a remittent type. No trace of hæmoglobin in urine when examined by the spectroscope during the clear days. The hæmoglobinuria ceased on the eighteenth day. For another fortnight the temperature ranged from 99-100° F., and was uninfluenced by quinine (5 gr. t.d.s.), which was not given, however, during the hæmoglobinuric stage. At no time could I demonstrate any malaria parasites in the blood-film.

The spleen was much enlarged. There was no jaundice and no vomiting after the first few days. The hæmoglobinuria was associated with rather severe epigastric pain. He became very anæmic and weak; his convalescence was rapid after the blackwater had ceased, in spite of his prolonged low fever.

Manson-Bahr, in speaking of the diagnosis of malaria, says tertian and quartan periodicity occur only in malarial disease. When either is thoroughly established, its presence is almost conclusive as to the cause being malarial. In this case it seemed as if the bout of tertian fever had been replaced by a paroxysm of hæmoglobinuria.

Two other of my cases showed a definite periodicity in the appearance of their hæmoglobinuria. In both instances the hæmoglobin appeared in the urine for a few hours only every day; in one case over a period of fourteen days, and in the other case for one week. Both cases showed this intermittance in the appearance of the hæmoglobinuria from the beginning of their illness.

The patient who passed the hæmoglobinuria intermittently for the fourteen days was a Samoan teacher. The bout of blackwater occurred daily between the hours of 10 to 2 p.m., and was always associated with a rigor.

The urine cleared by the evening. Surely one thought this is a case of tertian malaria, yet quinine (5 gr.) every four hours for five days had no influence in controlling the hæmoglobinuria, and no malaria parasites did I demonstrate in the blood. The hæmoglobinuria ceased as mysteriously as it commenced—not until the patient had become very anæmic and jaundiced with big spleen. He eventually made a quick convalescence and recovered completely.

The following case also seems to indicate a close relationship between malaria and blackwater fever. M. C. sent for me on the evening of April 18, 1921, on account of a violent attack of fever, ushered in with rigor, severe vomiting, retching and diarrhœa, and temperature of 103° F. Spleen edge palpable, about two-fingers' breadth below costal margin. Numerous subtertian ring forms of the malaria parasite in blood-film. He was given an intramuscular injection of quinine, 12 gr., and put on quinine sulph., 7½ gr. t.d.s.

The next day his vomiting ceased and his temperature fell to normal, and remained so until April 22, 1921, for four days, when he again sent for me on account of another attack of fever, quite similar to the previous attack, but with the added fact of hæmoglobinuria. He then passed through a severe attack of blackwater fever lasting three days, associated with all the classical signs: rigor, high temperature, vomiting, anæmia, very pronounced jaundice and hæmoglobinuria. I could not demonstrate any parasites in his blood after the onset of hæmoglobinuria, and immediately stopped his quinine, which seems to have no effect whatsoever on checking the hæmoglobinuria. One admits that the hæmolytic factor is still unknown, but surely in such a case as the above malaria played some part in the producing of the unknown hæmolytic factor.

The case of G. H. illustrates well, I think, the difficulty in defining blackwater fever with precision.

G. H. consulted me one day for a "touch of blackwater"; he gave the following history: While at work helping to lift a heavy fencing post into place he felt a dull pain in the lower part of his back. He finished his job and still complained of the dull ache in his back. After his arrival home some hours later he urinated and noticed that his urine was black; he did not feel feverish, but the dull ache in his back still continued. He turned in early, slept fairly well, and next morning his urine was clear and his back somewhat easier.

I saw him a few days later, could detect nothing in his urine or elsewhere to account for his previous bloody urine, which I attributed to traumatism.

The pain in his back had by this time disappeared. He returned to me again in eighteen days with a history of passing bloody urine once more a week previously. He noticed blood in his urine several hours after lifting a dead cow. The blood in urine continued for ten hours. He had a dull aching pain in his back, especially on the right side in kidney region. The pain disappeared in a few days with rest, &c. Ten days after this he developed an attack of fever, which culminated on the third day in a typical attack of blackwater fever. I did not succeed in demonstrating any malaria parasites in his blood. How would one classify these first two attacks, which certainly seemed to have been larval forms of blackwater fever?

On questioning him in regard to malaria, he volunteered the statement that for the past six weeks he had been having slight attacks of fever, not sufficient to lay him up, but quite enough to make him feel very much out of sorts.

I obtained a similar history in one of my fatal cases, who stated that for some time past she had been having a low type of fever.

"The fever would not come out," as she expressed it, but was sufficient to produce a feeling of ill-health.

In this last case the attack of blackwater was very sudden, with most severe rigor and temperature of 106·2° F.; porter-coloured urine complicated a second rigor. Most distressing vomiting of great quantities of bile then set in, soon followed by a copious bilious diarrhœa, and death within forty-eight hours.

Quinine is undoubtedly an important exciting factor in the production of an attack of blackwater fever in some individuals, as the following case well demonstrates. It also supports J. F. Gaskell's contention that each patient has a critical dose of quinine; amounts below this dose can be tolerated successfully.

Mrs. C., suffering from a chronic malaria, with sallow complexion, some emaciation, and with a huge spleen, whose margin reached well down into the left iliac fossa. She gave a history of having intermittent attacks of fever of no great severity for several months, and also, as I found out later, of having to be very careful with her dosage of quinine, "as it was so likely to bring on blackwater when she had fever."

I did not demonstrate any parasites in her blood. She was put on quinine bihydrochloride, 5 gr. t.d.s. After five days' treatment, as she had a slight relapse of malaria, I decided to increase the dose of quinine to 10 gr. t.d.s. I did so. After taking the mixture for three days she developed a smart attack of blackwater fever on the third day. I immediately stopped the quinine. Fortunately the attack was brief and the urine clear of hæmoglobin in forty-eight hours.

Four days later, by a mistake, she was given one dose of this quinine mixture at 2 p.m. At 4 p.m. she had a most acute rigor, associated with deafness and buzzing in the ear, and black urine.

In this instance the urine cleared in twenty-four hours, and the patient went straight ahead with no more attacks of fever and a gradual diminution in the size of her spleen.

Conclusions.

I have endeavoured to indicate by the recording of the above cases of blackwater fever as it occurs in Papua.

(1) That malaria is an essential contributing cause in the production of the hæmolytic factor.

(2) That the hæmolytic factor has still to be demonstrated.

(3) That it is impossible to define blackwater fever with any definite precision as it is not a specific disease, but rather a symptom complex; in fact, a complication of malaria.

To adequately treat the malarial factor will prevent the appearance of blackwater fever.

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Clinical Calorimetry. Metabolism in Erysipelas (Warren Coleman, David Barr, and Eugene du Bois, *Archives of Internal Medicine*, vol. xxix, No. 5, May, 1922).—Ten calorimetric experiments were made in five cases of erysipelas. Two were taken on the day following the crisis; the others were made during the febrile course of the disease.

During the fever the metabolism is increased from 19 to 42 per cent. above the average normal basal. The increase in metabolism is roughly proportional to the degree of fever. A temperature of 40° C. involves a heat production of about 40 per cent. above the average normal.

The change in rectal temperature is not always an accurate index of the change in average body temperature in erysipelas. The regulation of body temperature is similar to that observed in malaria during the stage of high continuous temperature. Both heat production and heat elimination are maintained at a high level.

The heat lost in the vaporization of water constitutes from 23·6 to 33·4 per cent. of the total heat elimination. During rising, constant and falling temperatures, the percentage of heat eliminated in the vaporization of water was greater than in normal individuals.

No specific differences were found between the metabolism in erysipelas and in typhoid fever. Both fevers show approximately the same increases in the level of heat production for the same increase in body temperature. The protein metabolism is greatly increased in both diseases.

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JULY 1, 1922.

LEPROSY NOTES.

WILL anyone outside leper asylums and the general public, as the subject is served up to them in the lay press, trouble to read anything on leprosy? When the subject is brought before a medical society, be it at home or abroad, the reader of the paper will usually find his audience few in numbers, and confined for the most part to officials of the society. Now and again when leprosy is brought up at dermatological medical societies in so-called non-leprous countries, a certain number of the specialists present have almost invariably tales of leper patients amongst their clientèle to relate with histories of their pathological findings and of the cures they have accomplished. With the general body of investigators, however, the subject is looked upon as a branch of medicine apart. Moreover, medical men practising in leper-infected districts do not care to say much about the matter, as if it gets abroad their patients look askance at a doctor who studies the subject or sees much of lepers in case they may become contaminated and spread the disease to others, or it may be to themselves or their families. In this manner the disease is shunned and neglected, and but slow advance is made in our knowledge of the dread ailment.

That the leper is dreaded to-day by the general body of the medical profession is undoubted, and even the doctor who attends to them in asylums is asked to dinner with misgiving as to the expediency of doing so. Strong opinions are held both ways—those who regard the "leper touch" as an active entity of infection and, on the other hand, those who despise the leper as being in any way capable of contaminating others. Tradition, however, has much to do with the peculiar position leprosy holds amongst both the lay and medical public, and the day of its elimination seems as far off as ever. The cutting apart of the disease from other collateral ailments hampers the study of leprosy, for, except in the pronounced forms, little is known of possible mild forms which may be mistaken for chronic, peculiar skin ailments of an intractable type. The Old Testament accounts of leprosy are cast aside with contempt, and yet there is no disease so elaborately dealt with by the Bible chroniclers—aye, even more elaborately than plague itself. Up to the time of the appearance of plague in Hong-Kong in 1894 no information concerning this disease was to hand in the text-books of medical literature in the world At that date, however, attention of the writer was directed by a clergyman to the account of plague in the 4th, 5th and 6th Chapters of the first Book of Samuel, and he interpreted the technical terms in use, and the understanding of the disease became an open book. There is no doubt that the interpretation of leprosy is as simple and clear, but we have lost the key to it, but it is there the riddle is to be read as plague was.

Like in many other diseases the bacillus is found, but the explanation of its origin and spread remains as a sealed book.

At one time the writer associated leprosy with tuberculosis; he sought to identify the bacilli of each disease, he sought to cultivate the bacillus of leprosy, and with three specimens—a tubercle bacillus, a leprous bacillus, and a cultivated leprous bacillus placed beneath three adjacent microscopes, he confused three of the German professors in the University of Tokio, so much so that the (normal) leprous bacillus was declared to be the tubercle

bacillus, and the (normal) tubercle bacillus the "cultivated" leper bacillus. On reading (this is thirty years ago) that the leper bacillus could not be cultivated, he destroyed his specimens and stopped investigations in this direction. He repents now having done so, for, in spite of the denunciation of all association or identification of the bacilli, pulmonary tuberculosis remains the leper's most frequent concomitant of all collateral ailments.

In a paper read before a meeting of the Fiji Branch of the British Medical Association by Dr. P. Harper in May, 1922, the causes of death in the first 157 deaths at the Makojai Leper Asylum were: "Tuberculosis, 42; septic infection, 31; nephritis, 18; leprosy, 14; exhaustion, 5; undetermined, 5; tetanus, 4; senility, 3; pneumonia, 3; dysentery, 3; suicide, 3; amyloid disease, 2; malignant disease, 2; filariasis, 2; peritonitis, 2; influenza, 2; mitral disease, 1; angina pectoris, 1; pulmonary embolus, 1; cerebral tumour, 1; duodenal ulcer, 1; intestinal ulceration, 1; bronchitis, 1; renal abscess, 1; general paralysis of the insane, 1; epilepsy, 1; hemiplegia, 1; pharyngeal ulceration, 1; diabetes, 1; syphilis, 1; anæsthesia, 1; fatty heart, 1."

It will be seen that tuberculosis (presumably of lung) forms more than a quarter of the causes of death in lepers.

This, of course, does not prove identity of the bacilli, but only that under the wretched conditions in which most lepers live outside leper asylums, pulmonary tuberculosis is, as in persons not suffering from leprosy, a common ailment. The most that can be said is that, as typhoid is to the para-typhoids, so may leprosy be as a para-leprosy when the matter is more carefully sifted.

The writer may yet add another experiment which still further led him astray. At the time Koch brought out his first inoculation against pulmonary tuberculosis, the writer within five weeks of that discovery inoculated several lepers suffering from "tubercular" leprosy, and obtained strong reactions in all lepers treated, and a radical improvement in the symptoms of the men thus treated. One example will suffice. A leper working on the roads with a number of other men who were free from leprosy objected to this leper working with them, for he was so sad a sight that they sent him off from the gang. After a Koch's inoculation the signs and symptoms so abated that they allowed the man to return to work with them after ten days. The treatment was not followed up because the supply of Koch's fluid gave out after three injections, but by that time the man's face eruption was well-nigh in abeyance. The reactions after injections were definite and the first very severe.

An attempt to examine the earth from lepers' graves in search of a bacillus was systematically made in a London laboratory. The earth was obtained from several leper graves in a graveyard in an island off the coast of China. Nothing was found, but the writer cannot vouch for the thoroughness of the examination; the earth was moistened, wrapped in mackintosh cloth, and put into several separate tins with soldered lids; but little if any value, however, attaches to this examination.

Now and again "scares" of leper infection are brought forward; loss of eyebrows is not uncommon, the particular spot being the outer one-third or even half of both the eyebrows, the baldness remaining, and the writer knows of one case in which it existed for thirty years with no sign of recrudescence of the hair. Numb patches on the legs, especially with some pigmentation—which remains permanently—have also been regarded with suspicion and some dreaded by doctors having much to do with lepers. These have never, to the writer's knowledge, progressed to any further complications. After all, leprosy is not incurable. In time and under good conditions of sanitation and diet it may, although if left to itself, often with a good deal of mutilation, cease to spread and altogether cease from troubling.

Chaulmoogra oil by the mouth is the simplest form of treatment, and by the mouth, subcutaneously, and intravenously in various forms the oil is being extensively used, as derivatives in various forms; and even tartar emetic. Chaulmoogra in one or other form is the standby to-day, and if it can be administered by the mouth, it is more likely to be followed by those who are outside asylums where injections are unattainable as a rule.

The writer has one patient to-day who has been under chaulmoogra for some three years or more, and he takes as much as 120 minims daily. Scarcely a single sign or symptom is to be found anywhere on the body, and he takes it without inconvenience by the mouth. The object of these rambling remarks is not to discourse on the treatment of leprosy, but to raise the question of forms of leprosy other than the advanced and typical forms, and to keep an observant eye on quasi or "para" types which are apt to be disregarded and to be mistaken for other forms of ailments and skin and nervous affections, obscure and undiagnosed.

J. C.

Editorial Notes.

THE OUTLOOK IN TROPICAL HYGIENE.

Dr. Andrew Balfour delivered an address at the Royal Sanitary Institute, 90, Buckingham Palace Road, on April 26, choosing as his subject "The Outlook in Tropical Hygiene."

His keynote was the value of research, coupled with the importance of education, of both the general public at home and the native in our tropical dependencies, in the essential aspects of sanitation and prevention of disease.

Advance in our knowledge of preventive medicine and hygiene, alike in temperate and tropical countries, had long been hampered by empiricism,

for conservatism and cherished beliefs died hard. While not denying the occasional uses of fumigation and disinfection under certain conditions, he thought undue reliance was too often placed on their much vaunted power of eradicating disease and preventing the spread of disinfection. Such measures were limited in their scope and were frequently but a coat of camouflage, cloaking ignorance of the underlying causes of infection, which enlightened research had done, but still needed to do, much to remove.

This country he maintained had been foremost in providing pioneers in tropical medicine. A warning note was, however, necessary that that pride of place, long held, was in danger of being lost, for want of recognition of the results of past efforts and for failure to appreciate the importance of research, the basis of pure science, or, more correctly speaking, the science of truth.

In matters of research we were suffering from political shortsightedness and easy-going trust in individual scientific and financial effort, which were allowing our international colleagues to outstrip us in America, France and Holland—countries where intelligent Government support and co-operation had done much to further the application of the results of research in tropical medicine and hygiene.

The true research worker was born, not made, with initiative and imagination to direct a particular line of inquiry and to apply it correctly. Two types of research worker were to be recognized, the one with the ideas, the other with the power of application, rarely found combined, save perhaps in the superman.

By inspiration and far-seeing realization of the possibilities of elucidating a special point, one man might provide the clue wanted, but not possess the necessary technical skill and perseverance to trace it to conclusive proof. Another, with less visionary power and imagination, prompted by the other's suggestion, might be endowed with the practical ability, patient industry and intelligent judgment to put the idea to the test and to carry it through to a correct conclusion. Chance, ever unreliable, had, it was true, on rare occasion supplied the clue to important discovery.

Granted a man possessed the qualities which fitted him for research, it was of the utmost importance that his work should not be impeded by the calls of routine examinations, whether from hospital or private sources, and that he should be left free and unhindered to carry out his own line of research in his own way. Moreover, the remuneration of the research worker should be adequate and insured by endowment, to enable him to pursue his researches without financial anxieties. Yet it was remarkable what valuable work had occasionally been accomplished, despite the interference of routine duties. The late Sir Patrick Manson, when in general practice at Amoy, in China, first made his researches into the ætiology of filariasis.

Constant revision of accepted beliefs as to the causes and course of infective processes, especially in diseases of the tropics, was needed to verify the correctness of our conclusions.

In particular he instanced ankylostomiasis, in which recent investigations in America had shown the pig to be a disseminator of hookworm larvæ, hitherto unsuspected, save by observers in Queensland and also by O'Connor working in the Ellice Islands (W. Pacific).

For the prevention of plague, it was doubtful whether efforts to destroy the rat were being pursued on right lines. Certainly their fertility and rate of breeding quite surpassed the rate at which they could be exterminated, and suggested that measures should rather be directed to checking their productivity.

If the rat could be prevented from reproducing its species, the plague problem would be to a large extent solved. Attempts to produce infective abortion and sterility, based on a study of the bacteriology of the urogenital tract of the rat, had been made, but so far without success.

Dr. Balfour also mentioned the long misplaced credit in the efficacy of lime juice in the treatment of scurvy, which only recent research by Miss Chick and others had shown to be unfounded in the discovery of the much higher antiscorbutic properties of the lemon. Although the latter had originally been used in early days, the lime, now known to be far less potent in scurvy, had been substituted on account of its cheapness. Such suggested examples of the constant need for research, and yet more research, into the hidden causes of the spread of disease and its prevention were particularly applicable to tropical medicine.

Sanitation in the tropics was a subject which, until the Great War, had received but little serious attention; but as the result of the lessons learnt in the past eight years, and, thanks to the help provided by the Royal Sanitary Institute, the importance of the subject was being realized.

A special course of instruction was much needed in this country for men and women, destined as sanitary inspectors in our colonies, to qualify for the certificate in tropical sanitation, granted by the Institute.

The sanitary inspector in the tropics should fill the rôle of the apostle of hygiene to the native populations of our colonies.

Much was to be hoped from his mission to inculcate the principles of sanitation and prevention of disease among the inhabitants of our tropical dependencies.

Important though a sound knowledge of sanitary science might be in its application to a temperate climate, the realization of its value was vastly more necessary in the tropics. That fact and the need for research could not be too strongly impressed on the electorate and Government at home, and that money, voted for such purposes, should be regarded as outlay, sure of good return, not merely in improved health conditions, but, as certainly, in the

resulting financial and economic prosperity of our colonies.

Progress in the science of tropical medicine had suffered from lack of appreciation and support by the Government and a short-sighted hesitation to devote public money to the soundest of all investments, the health of the nation, whether at home or in the colonies.

Dr. Balfour also appealed to the financial magnates of this country to follow the example set by generous American philanthropists and to make good deficiencies in the provision of facilities for research into the many problems of tropical disease, without which England's hitherto prominent place in the march of science could not be maintained. Failure of co-operation and co-ordination of the individual research workers' efforts had also materially retarded scientific advance and its practical application. In that respect, however, the recent organization of the Medical Research Council, by acting as a centralizing bureau for the collection of the results of research and by the limited provision of grants, had gone far to remedy existing shortcomings.

Much, too, was to be hoped from the Imperial Institute of Hygiene in prospect, and shortly to be established in London through the generosity of the Rockefeller foundation. Dr. Balfour therefore felt that the outlook in tropical medicine was on the whole promising, and though obscured, the light was dawning.

He concluded by quoting Disraeli's introduction of the Public Health Act of 1875, when that far-seeing statesman appropriately reconstructed the ancient preacher's dictum, "Vanitas vanitatum, omnia vanitas" by the rendering "Sanitas Sanitatum, omnia Sanitas"—a fitting appeal for Government support, just as applicable to the needs of the present day.

J. G. F.

DYSENTERY IN THE BRITISH WEST INDIES.

In the course of a paper on this subject read before the Section of Tropical Diseases at the Royal Society of Medicine on May 1, Dr. John Anderson gave statistical figures of the mortality rates of dysentery, enteric fever, diarrhœa and enteritis in the Demerara districts of British Guiana, in the islands of Trinidad, St. Vincent and Grenada, and in Kingstown, the capital of Jamaica.

During 1920 the death-rates from all causes ranged from 22 per mille for Demerara, 17·57 for Grenada, and 11·8 for St. Vincent.

A rough average of the detailed figures showed that true dysentery accounted for 5 per cent., whilst other intestinal diseases, including enteric fever, diarrhœa and enteritis, were responsible for over 20 per cent. of the total deaths in the West Indies.

For want of sufficient laboratory facilities, the diagnosis of intestinal disorders is necessarily open to much inaccuracy, being based chiefly on clinical grounds or the degree of response to emetine treatment. Amœbic dysentery is regarded as much more prevalent than the bacillary form, and, owing to inexact methods of diagnosis and unatisfactory treatment, is attended by a high death-rate.

The usual method of treatment consists of preliminary emetine injections; but a case failing to respond to it is presumed to be one of bacillary dysentery and then given sodium sulphate.

Use is also made of native remedies of local repute, some of scientific value, such as ipecacuanha root and the astringent bark of certain trees. Of amœbic abscess of the liver and intestinal perforation from an ulcer, Dr. Anderson had seen only one or two cases in the West Indies.

His paper was illustrated by a number of lantern slides which showed the sanitary conditions prevailing, and particularly the contamination of water supplies.

The conditions of sanitation in British Guiana are probably unique, and, as Dr. Anderson observed, owing to the unenlightened state of the majority of the inhabitants, prevention of the spread of dysentery lies yet in the realm of pious hopes.

The free pollution by coolies of the banks of streams, which may serve as water supplies, is a fertile source of infection of all forms of intestinal disorder. The methods of sewage disposal, whether from open latrines built over the various watercourses, or by cess tanks and midden pits, are a serious menace to the health of the general population. The midden pits swarm with rats, and by occasional overflow, leaving noisome deposits on the surface, become the haunt of flies for the dispersal of infection.

Moreover, the periodic emptying of the pits and the carriage of the foul contents through the streets are a constant offence and danger to the town dweller.

A number of small septic tanks are in use in Demerara, but their effluents are insufficiently screened, and are even conveyed into the open canals which run through the towns.

As the report of the Special Commission sent by the help of the Rockefeller foundation from this country to the West Indies in 1921 has shown, Dr. M. Khalil found the living ova of helminth parasites in the effluent from one of the septic tanks. The prevalence, therefore, of ankylostomiasis, dysentery and other intestinal disorders will occasion no surprise.

Although there is no lack of enthusiastic workers, there is undoubtedly much need for improvement, with better facilities for instruction and the provision of sufficient laboratories.

Dr. Anderson's concluding remarks echoed the appeal made by Dr. Andrew Balfour last year in his report on sanitation in Mauritius, and in his recent address on the Outlook in Tropical Hygiene given at the Royal Sanitary Institute.

Drastic measures of sanitary reform would indeed

seem as pressing in the West Indies as in Mauritius, and clearly call for energetic action by the Colonial Government.

Dr. Anderson emphasized, firstly, the need for encouragement and intelligent support by the Imperial Government; secondly, the importance of closer association between the insular medical services and the schools of tropical medicine in England; and lastly, the call for an extension of educational facilities for the rising colonial generation

The vital question, affecting not merely our West Indian colonies, but all our tropical dependencies, is one in which, for financial and economic reasons alone, measures of improved sanitation and prevention of disease should be recognized as of the first importance.

J. G. F.

Annotations.

Ulcerating Granuloma (Granuloma inguinale) (Mihran B. Parounagian, M.D., and Herman Goodman, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 5, May, 1922).—The clinical similarity between the lesions about the genitals and perineum in this case and in the one illustrated by De Souza Araujo in his thesis is very striking. His patient also had latent tertiary syphilis.

This case furnishes food for thought because the involvement of the lip and neck presumedly by the Donovau body brings up the possibility that this organism and that of rhinoscleroma are the same, as has been claimed. Morphologically, these organisms, seemingly fitting into the mucosus capsulatus group, are somewhat similar, especially from culture, but recent work in agglutination has not shown a close relationship. Clinically and pathologically there is no resemblance between the lesions of rhinoscleroma and ulcerating granuloma. Incidentally, although it is easy to demonstrate the rhinoscleroma organism in tissue preparations from rhinoscleroma, no one has yet demonstrated the Donovan bodies stained in tissue from ulcerating granuloma. As far as is known, there has been but one other case with lesions about the lip, reported by Sequeira.

The chief points of interest in this case were: the patient was a white man, born and reared in New York City. He undoubtedly had tertiary syphilis. He had lesions of ulcerating granuloma, of Donovan body origin, of the groins, anus and surrounding parts, with cicatrization, and œdema of the penis and scrotum. In addition, he presented similar lesions of the upper lip and the side of the neck. He showed also a smooth, glossy atrophy of the tongue. Silver arsphenamin and neo-arsphenamin were of little benefit.

Collodion Sacs for Aerobic and Anaerobic Bacterial Cultivation (Frederick L. Gates, *Journal of Experimental Medicine*, vol. xxxv, No. 5, May, 1922).—A simple and convenient method is described for the preparation and use of collodion sacs for aerobic and anaerobic bacterial cultivation *in vitro*.

The sacs are suitable for the study of various problems in bacterial growth and metabolism. By their use with the Smith-Noguchi tissue medium, certain micro-organisms may be grown in the absence of the confusing, antigenic protein precipitate characteristic of cultures containing fresh tissue, and thus the organisms are obtained in a suitable condition for serological study.

Study of some Cases of Diabetes Insipidus with Special Reference to the Detection of Changes in the Blood when Water is taken or withheld (C. D. Christie and G. N. Stewart).—The regulation of the excretion of water by the kidneys was studied in two cases of diabetes insipidus presenting the typical features, and in one case of polyuria of acute onset, apparently associated with a brain lesion. In the last case the polyuria disappeared permanently after lumbar puncture, but the patient eventually developed symptoms of mental derangement.

Blood specimens obtained immediately before and immediately after a long period of complete deprivation of water (twenty-four hours or more) showed no definite differences in the electrical conductivity of the serum, which could be associated with changes in the rate at which water was being absorbed, transported and excreted, although the conductivity can be measured with great accuracy. The same was true of the percentage volume of serum.

Comparison of blood specimens procured within half an hour, and again after five or six hours, after the resumption of water drinking with the specimens obtained just before or just after the period of water deprivation also revealed differences in the conductivity of the serum so slight and so inconstant that it was impossible to connect them definitely with changes in the intake of water.

The percentage of serum, in the observations carried out completely, seemed to be somewhat greater in the specimens taken after five or six hours than in the specimens taken half an hour after resumption of water drinking.

The regulation of the concentration of electrolytes in the plasma and of the relative volume of plasma and corpuscles in the blood was, therefore, at any rate as fine in these cases of diabetes insipidus, in spite of the great variations induced in the quantity of water transported, as in normal persons. It is possible, indeed, that in this condition the renal excretory mechanism is even less tolerant than normal of any excess of water in the blood, or the tissues less capable than normal of storing an excess of water.

No evidence was obtained that the condition was associated with any pathologic change in the

kidneys. The various tests of efficiency of renal function gave normal results. When pituitary extract was administered the kidney showed normal power of concentrating the urine.

A Study of Hæmoglobin Metabolism in Paroxysmal Hæmoglobinuria (Chester M. Jones, M.D., and Basil B. Jones, *Archives of Internal Medicine*, vol. xxix, No. 5, May, 1922).—In the absence of complicating factors, varying degrees of blood destruction in man are accompanied by corresponding variations in the concentration of bile pigments in the blood plasma and bile.

In man, the liberation of excessive amounts of hæmoglobin into the circulation results, first, in the rapid elimination of hæmoglobin from the blood-stream and its replacement by bilirubin; second, in the more gradual disappearance of an increased amount of bilirubin in the bile; third, in subsequent diminution of bilirubin in the bile, and its replacement by increased amounts of the lower bile pigments, notably urobilinogen and urobilin; and fourth, in the gradual elimination from the bile of excessive amounts of the latter pigments. There is a definite time interval between each of these phenomena. The above process is probably only an exaggeration of the normal process involved in the metabolism of hæmoglobin.

Experimental evidence in man suggests strongly that the bulk of this pigment elimination is normally carried on by the liver.

Under normal conditions, in man as well as in animals, free hæmoglobin can be broken down, at least as far as the bile pigment bilirubin, in the blood-vessels, capillaries, and tissue spaces, without the intervention of the liver or any other organ.

These experiments suggest that a large part of the transformation of hæmoglobin into bilirubin could occur normally in the blood-vessels. Possibly the greater portion of this change takes place in the blood-vessels of the liver because of the vascularity of this organ.

The low bile pigments urobilin and urobilinogen can be formed in the liver without the intervention of bacterial action in the intestine.

Madura Foot more properly called Mycetoma (Gustav A. Pagenstecher, *Journal of the American Medical Association*, vol. lxxviii, No. 18, May, 1922).—Madura foot is a chronic disease; the author describes two cases which prove this. The first patient dates the onset of his illness to an injury received four years previously. He was able to do light work, and still does it. Has occasional pains, mostly at night, but is able to walk unassisted and with little inconvenience. The second patient dates onset from seventeen years previously. On admittance to hospital he complained of pain in foot which prevented heavy work, but walked without assistance.

The treatment is essentially surgical. Only when the extremity is in such a condition that the patient is unable to get about in any manner is amputation recommended. Since the disease does not metastasize by blood or lymph, but only by slow, direct extension, the patient may easily outlive the course of his disease. Some authorities treat this disease by the administration of massive doses of potassium iodide, basing their therapy on the close similarity of madura foot to actinomycosis. Other authorities treat by curetting the sinuses in conjunction with the administration of arsphenamin.

In the differential diagnosis of madura foot one has to exclude actinomycosis, tuberculosis, syphilis and sarcoma.

Actinomycosis rarely attacks the foot, being more likely to become a generalized infection; it is not so chronic, and a cure may be obtained. In tuberculosis there may be a temperature reaction, bone destruction, and quantities of pus escaping from the sinuses.

In syphilis, with comparatively as much involvement, a positive Wassermann reaction would be expected.

In sarcoma, with the exception of the large round cell type, so commonly found in bone cysts, the growth would be more rapid and more extensive, and probably have metastatic involvements.

The Relation of Diet to Pellagra (Joseph Goldberger, M.D., *Journal of the American Medical Association*, vol. lxxviii, No. 22, June, 1922).—Diet controls the course and development of this disease. The relationship thus disclosed probably depends primarily on a specific quality of the amino-acid make-up of the protein supply.

Oral Sepsis and Systemic Disease (W. Bertram Watson, *The Practitioner*, vol. cviii, No. 6, June, 1922).—Cases of oral sepsis, which may cause systemic disease, can conveniently be divided into two groups:—

(1) Pyorrhœa alveolaris, known as Rigg's disease, and described by him in 1867; a disease beginning at the gingival border, with progressive destruction of the alveolar walls, and accompanied by a flow of pus.

(2) Apical infection, acute or chronic; often accompanied by the presence of dental granuloma, a small mass of granulation tissue containing bacteria at the apex of the tooth.

It is not desired to exaggerate the importance of oral sepsis as a factor in the production of systemic disease, but rather to point out that physicians and dental surgeons should be alive to its significance and potentialities.

Is it too much to ask that no dental surgeon shall embark on any scheme of construction work without obtaining from the physician particulars of the general health of the patient? Should not the physician take into friendly counsel the dental surgeon before recommending to the patient the wholesale removal of teeth, a course frequently

advised without investigation or due consideration? It is thought that real co-operation between doctor and dentist would lead to a revolution in the science and art of dentistry.

Abstracts and Reprints.

GLYCOSURIA OF MALARIAL ORIGIN.[1]

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Malaria may simulate very many internal diseases, but we are not aware of cases of malarial glycosuria and malarial diabetes having been placed on record; the following two cases may therefore be of some interest:—

Case I.

J. F. S., a demobilized soldier, aged 32, was admitted to the Tropical Section of Orpington Hospital on April 13, 1921, as a case of malaria. He had his first attack in August, 1916, when malignant tertian parasites were found; since then he had had numerous relapses. On admission the temperature was 98·8° F., and the pulse 120; the patient was pale and tremulous, he stated that he had lost flesh and complained of great weakness. Physical examination of the chest revealed nothing worthy of note. The spleen was not palpable. No malarial parasites were present in the blood. Differential count: Polymorphonuclears, 63; large mononuclears, 9; lymphocytes, 33; eosinophiles, 1. In the fæces no cysts were found. The chemical analysis, kindly carried out by Dr. Lynch at the Central Chemical Laboratory, Ministry of Pensions, Chelsea, gave the following results:—

Total solids, 22 1 per cent.

Fat	8·6 per cent.
Fatty acid	2·8 ,,
Soaps (as fatty acid) ...	2·8 ,,
Total	14·2 per cent.

The urine, specific gravity 1031, was slightly acid, the amount passed during twenty-four hours was only very slightly increased. It contained sugar 8·5 grm. per litre, but no albumin. Acetone and diacetic acid were absent.

On April 14 the patient was placed on a fairly intensive quinine treatment (10 gr. three times daily). The sugar present in the urine decreased rapidly after twelve days' treatment, but there was still a quantity sufficient to reduce Fehling's solution and to give phenyl-glucosazone crystals, though not enough to estimate. The patient was then given, in addition, a course of six injections of quinine hydrochloride intramuscularly of 15 gr. each. On May 10 the quinine hydrochloride injections were discontinued, and quinidine was given in their place (30 gr. daily).

The urine was examined again on May 13, 16, 17, and 18, and did not give any reduction of Fehling's solution, nor did it give phenyl-glucosazone crystals.

At no time was the patient put on antidiabetic diet, and there was no restriction of his carbohydrate intake. There can be little doubt, therefore, that the disappearance of the sugar was due to the administration of quinine.

When the patient was admitted to hospital he was feeling very weak, and complained of having lost a great deal of flesh. There was, however, no polyuria, no boulimia, no thirst. On May 20, 1921, the general appearance of the patient had much improved, and he expressed himself as feeling better than he had done for years.

Case II.

Mr. E. N., aged 44, married, with no family history of diabetes, consulted one of us in March this year. During the war he served in one of the Allied armies, and in 1916 he contracted, while in the Balkans, a severe malarial infection; he had several relapses, the last being on December 19, 1920. In January, 1921, he noticed that he was feeling more hungry and thirsty than usual, was passing much more urine than normal, and was losing flesh. He consulted a medical man, who found a fairly large amount of glucose in the urine (2 per cent.), and placed him on a very strict diet, which induced only a slight decrease in the amount of sugar present in the urine. When the patient consulted one of us in February the urine contained 1·5 per cent. of glucose; it was acid, specific gravity 1032, no albumin, and acetone and diacetic acid were absent. The amount of urine passed during the twenty-four hours averaged 6 pints.

The patient looked rather emaciated and very anæmic; the skin was of a pale, earthy colour, with patches of hyperpigmentation resembling chloasma, so often seen in cases of chronic malaria. His spleen was very slightly palpable and very hard. The examination of the blood did not show any malarial parasites, but there could not be any doubt clinically that he had chronic malaria, and the diagnosis was made of "diabetes in a malarial subject." He was advised to continue the strict diet he had been having for the glycosuria, and in addition to take 10 gr. of quinine three times daily for his malaria. He came back three weeks later feeling much better; the enlargement of the spleen had disappeared, and—a most interesting feature—the amount of sugar had decreased enormously, being less than 0·1 per cent. We came to the conclusion that it might be a diabetes syndrome of

[1] Reprinted from the *British Medical Journal*, August 20, 1921.

malarial origin, and suggested to the patient that he should go back to ordinary diet but continue the quinine. He came to see us regularly once a week and the sugar did not increase; only a trace was present. During March the patient went to the South of Europe on business, and during all the time he was away (four weeks) did not take any quinine. He came back to this country in April, and three days after arrival, after playing golf in the rain, had a shivering fit, followed by very high fever, which ended in profuse sweating. The spleen again became palpable and hard, and examination of the blood showed the presence of a few rings of malignant tertian. The urine was examined after the temperature had come down to normal; it contained 1·2 per cent. of sugar. The patient was placed on an intensive quinine treatment by the mouth and intramuscular injections for six weeks without any dieting; not only did the symptoms of the chronic malarial infection disappear, but the urine became completely free from glucose, when examined by the usual methods of analysis (Fehling's, Nylander, phenyl-hydrazine, fermentation test).

Conclusion.

Our observations tend to show that there is a form of glycosuria of malarial origin, and that this condition may at times (Case No. 2) become so severe as to simulate true diabetes, the patient losing flesh, becoming very weak, complaining of thirst and hunger, and passing a large amount of saccharine urine. The glycosuria in our two cases was cured by the administration of quinine in full doses without any dietetic treatment.

Current Literature.

Bulletin de la Societe de Pathologie Exotique. Vol. XIV, No. 6.

Frequency of Iodinophil Amœbæ in Pigs in France (L. Cauchemez).—The iodinophil amœbæ found by Wenyon in human stools in 1915, and which were identified by S. L. Brug in 1919 as *Entamœba williamsi* Prowazek 1911, and by Dobell in the same year as *Entamœba butschli* Prowazek 1912, are, in the opinion of Brumpt, identifiable with neither; the latter has proposed for them the name of *Iodamœba wenyoni* Brumpt 1921. This organism was found in eight out of thirty-seven pigs from various parts of France examined within three days at the Paris slaughter-house, and in four out of a later series of animals. The true proportion is probably from 50 to 60 per cent. The elements seen were of two orders:—

(1) Vegetative forms, circular or oblong, vacuolar, with no membrane, showing a nucleus with a large and very siderophilous karyosome, and comparable to the vegetative forms observed in man.

(2) Cysts, circular or oblong, vacuolar, with a double contour slightly siderophilous; in the nucleus a spherical mass strongly coloured by the ferric hæmotoxylin used for staining, and a crescent formation of a lighter shade.

On a Process for Discovering the Eggs of Schistosomum mansoni (G. H. Morin).—Having shown that on the south-east coast of Madagascar a large proportion (about 13 per cent.) of apparently healthy individuals are carriers of *Schistosomum mansoni* eggs, and suspecting that the methods usually employed in the search for these parasites are apt to cause destruction of the delicate shells and thus lead to erroneous results, the author has devised the following process:—

(1) Dilute a fixed quantity of material in serum containing 10 per cent. of formol.

(2) Filter the emulsion first through wire mesh and then through coarse silk.

(3) After allowing the filtrate to stand for fifteen minutes, take five specimens of the sediment from five different points.

By avoiding centrifugation this method preserves *S. mansoni* eggs intact. It is not an effective test for other parasites, however, which, being lighter, are less likely to sink to the bottom unaided.

Observations on Malaria in Corsica (E. Roubaud and M. Leger).—A fortnight's inquiry in Corsica, during March and April, 1921, disclosed the fact that malaria has greatly increased in the island since 1914. The reasons for this are not clear, but conditions due to the war—movements among the population, importation of foreign virus, and want of labour to carry out the measures which had proved so efficacious during the period between 1912 and 1914, when the Institut Pasteur was actively endeavouring to control malaria in Corsica—are no doubt largely responsible for the recrudescence. Apart from quinine, of which a good deal is already taken preventively by the inhabitants in the form of *dragées*, two methods of prophylaxis are advised. The first of these is the opening up of the large lakes and marshy areas to the sea. The second is the building of lower and enclosed stables for the domestic animals; these are at present kept entirely in the open or housed in lofty, airy sheds, while in the hot weather they are removed to the hills. The people also migrate to the heights during the summer, so that the few who remain in the valleys are the sole and continuous prey of blood-sucking insects. The authors consider that the horses, cattle and pigs might be housed in less highly ventilated buildings without discomfort to themselves, and kept throughout the year wherever human beings are obliged to remain. In this way the latter would be protected to a large extent, and the dangerous concentration of infection among a few individuals prevented. Early in the season as it was, both *Plasmodium vivax* and *P. præcox* were found in the blood of children so far free from fever. This is in contradiction to Grassi's findings near Rome, and would tend to disprove the poly-

morphism theory by suggesting that the anophele is infected by both parasites at the same period, but that *P. vivax*, developing much more rapidly, invades the human medium first and masks the manifestations of *P. præcox*, which is inoculated later.

"Œdema Sickness" in Java (A. G. Salm).—This is a disease which began to come under the notice of French doctors in Java at the beginning of 1918. During the famine years of 1918 and 1919, when influenza and cholera were also raging, a large number of deaths were attributed to it. As no protozoa or other parasites have been found in the blood, "œdema sickness" is apparently a deficiency disease. The œdema begins in the feet and legs, and ascends to the trunk, arms and face; there is nearly always great emaciation, though this only becomes apparent when the œdema disappears; the skin is dry, the nails rough, and the eyes dull and hollow. There is very little anæmia and no paralysis (as in beriberi), no heart or lung symptoms, and not more than a trace of albumin in the urine. At autopsy the organs are observed to be atrophied. Death, which occurs in nearly 50 per cent. of the cases, is due to extreme emaciation and weakness.

Concerning a Case of Sleeping Sickness on the Lower Ivory Coast (H. Bauvallet).—Having isolated *Trypanosoma gambiense* from the swollen glands of a half-breed living in the Bassam district, the author entirely eradicated the organism by 2·40 grm. of atoxyl and 3·30 grm. of novarsensobenzol administered over a period of thirty-four days. He suggests, in view of the quantities given, that the less toxic novarsensobenzol was possibly as effective in destroying the parasite as the atoxyl. The entire population of the Bassam Circle was examined for trypanosomiasis on the occasion of a general vaccination against small-pox, and as no suspicious symptoms were seen in any individual, it was concluded that the case in question was one of importation.

Results of Ten Years' Experience of "Big Head" in New Caledonia (Ch. Nicolas).—A ten years' study has shown that the condition known as "big head" in horses is apparently a particular type of osteoporosis, differing from osteomalacia properly so-called in that it is contagious, although from a pathological point of view it possesses resemblances to the latter. In New Caledonia "big head" attacks horses exclusively, and at all ages. Osteomalacia is practically limited to foals, and though it is sometimes seen on the forehead, it also appears on all the bones, and especially on those of the legs in the neighbourhood of the joints. A foal may suffer simultaneously from osteomalacia and "big head," but "big head" is not seen in all cases of osteomalacia; moreover, the latter disease also attacks cattle, whereas no authentic instance of "big head" in cattle has been recorded. Osteomalacia would seem to be due to a deficiency of lime in the diet; "big head" to a filtrable virus—although, unfortunately, the germ has not yet been discovered. Finally, osteomalacia has so far proved incurable, whereas "big head," particularly at the onset and in young horses, may be treated both externally (Méré ointment) and internally (addition of lime to the drinking water) with very appreciable results.

Concerning Ornithodorus marocanus Velu 1919 (G. Senevet and Ch. Vialatte).—Finding "cheeks" or mobile wings consistently present on the camerostome of all *Ornithodorus* examined in Morocco, a characteristic not recorded by Velu, the authors have examined the types of *Ornithodorus marocanus* deposited by Velu and Vialatti at the Institut Pasteur, and have discovered the feature in question in a more or less strongly marked form in all but one of the specimens. They therefore consider that Velu's description of *O. marocanus* should be completed as follows:

(1) Infra-coxal groove generally terminating at the line between the first and second pairs of legs.

(2) The median post-anal furrow, after bisecting the transverse post-anal furrow, terminates at an equal distance from the said transverse furrow and the posterior margin. It usually widens at the end into a small area without granulations.

(3) Behind and outside of each of the coarse hairs at the base of the hypostome another hair of the same size is invariably found.

(4) The distal portion of the concave margin of the teeth, on the different pairs of feet, in nearly every tick examined, is brown in colour.

(5) On each side of the camerostome are two "cheeks" or mobile wings, which do not completely cover the buccal parts. These wings usually show three divisions, sometimes more. They do not occupy more than the anterior third of the camerostome.

The specification thus completed would appear to place *O. marocanus* in an intermediary position between *O. talaje* and *O. turicata*.

On the Hæmatozoa of the Gecko in General and Herpetomonas tarentolæ in particular. A Simple Culture Process for Herpetomonas (A. Laveran and G. Franchini).—In Algeria and Tunisia the gecko (*Tarentola mauritanica*) is often infested with hæmatozoa. Specimens of *T. mauritanica* examined in different parts of Italy during the summer of 1920 showed *Trypanosoma* alone in three cases, *Herpetomonas* alone in four cases, and the two parasites in association in four cases. *Hæmogregarina*, *Pirhemocyton* and *Trichomastrix*, as seen in the Algerian gecko, were in no instance observed in Italy. It was found that the *Herpetomonas*, and particularly *H. tarentola*, grew well in media obtained by adding a few drops of rabbit's blood to peptonized broth. The best cultures were produced at a temperature of 24° C.

On the Spirochætosis of Gallinea in the Doukkala Circle (Morocco) (P. Delanoe).—The author has

recovered from the blood of fowls a spirochæte with a maximum of eight spirals and a minimum of 3, a maximum length of 19·9 microns and a minimum of 11, a maximum width of 0·7 micron and a minimum of 0·5. He has infected ducks and geese experimentally with the parasite, but has not been able to isolate it from birds suffering spontaneously from symptoms identical with those produced after inoculation. The transmitting agent of the disease in fowls is *Argas persicus* Fischer, which is found in large numbers in all the fowl-houses of the district, particularly in summer. Injections of novasenobenzol have produced rapid cures in ducks and geese as well as in fowls, a suitable dose for the latter being 0·5 cg. per kilo. The question arises as to whether the spirochæte in question, which is so deadly for fowls in Morocco, is the same as that observed in Algeria.

THE INDIAN MEDICAL GAZETTE.
Vol. LVII, No. 4, April, 1922.

Laboratory Records from Mesopotamia. Cholera (F. P. Mackie, I.M.S., and Corporal G. Trasler, R.G.A.).—The incidence of cholera was not a prominent feature of the Mesopotamia campaign, though it was responsible for the loss of particularly valuable lives. There was a short epidemic in Amara in 1916, but practically none in 1917, whilst in the following year another outbreak occurred.

In view of the very prevalent idea that there is an association between outbreaks of cholera and the consumption of certain fruit, particularly melons, experiments were made with the following results: Undamaged melons, cucumbers, and tomatoes may be eaten with safety, but ruptured or damaged fruit, and especially sliced melons which have been exposed in the bazaar, should be strictly avoided.

The cholera vibrio can be recovered from melons seven days, and from cucumbers three days, after they have been inoculated. Melon pulp appears to be particularly suitable for the growth of cholera germs.

A New Form of Cutaneous Leishmaniasis—Dermal Leishmanoid (U. N. Brahmachari, M.A., M.D.).—The author has discovered a new form of cutaneous leishmaniasis, which he proposes to call dermal leishmanoid, in view of the fact that the eruptions are due to leishmania infection, whose virus has been modified by antimonial treatment. The cases observed had all been treated some years previously for kala-azar, and it seems that the virus of the parasite of kala-azar was attenuated by the antimonial treatment, and a case of deadly visceral leishmaniasis was converted into one of cutaneous leishmaniasis. This gives direct proof of the identity of the parasites of visceral and dermal leishmaniasis, which has been attempted to be proved indirectly by complicated inoculation experiments.

An Epidemic of Anasarca in the North Andamans (A. Bayley de Castro).—In March, 1921, an epidemic of anasarca, together with some gastro-intestinal disturbance, followed by syncope and death, was reported to have broken out amongst the free Ranchi coolies working for the Forest Department in the North Andamans. The prominent and most constant symptoms were:—

Swelling of feet, congestion of fauces, palpitation, breathlessness on exertion, hæmeralopia, digestive disturbances, diarrhœa or constipation, or blood and mucus in stools, swollen, spongy or bleeding gums, heaviness in legs, scanty high-coloured urine, highly acid, albumen rare. Distressing dyspnœa, dilatation of heart. Stomach enlarged—two cases of duodenal tenderness, two cases had marked tenderness in muscles of calf and shoulders.

Short Notes on a Case of Rat-bite Fever in Shillong (Biraj Mohan Gupta).—The patient was bitten by a rat in the middle of the forehead; the wound healed up in two days, and no further notice was taken of it till seven days later, when the site of the bite became œdematous and the temperature rose to 101° and 102° F. Severe pain was also felt as long as the fever persisted.

On the twelfth day the temperature fell and remained normal for four days, when it rose again and remained high for six days. During this second febrile attack the pain was more severe, the glands on both sides of the neck, the parotid and the submaxillary glands became swollen, causing difficulty in swallowing. The bowels remained constipated throughout. No skin eruption was noticeable.

Blood was drawn from the median basilic vein on the twentieth day and injected subcutaneously into two white mice, one of which was killed later. The spleen was found to be enlarged enormously; other organs were apparently normal. Smears from heart, blood, spleen and liver were made and stained by Leishman and examined. Only the cardiac blood smears showed scanty but typical spirochætes (*Spirochæta morsusmuris*), while the liver and spleen smears were negative. This spirochæte does not appear to have been seen before in this side of India.

Medical News.

NEW HUMAN PARASITES—*SPIROCHÆTA PERFORANS* CAVALIE AND MANDOUL 1921.

A SPECIES of spirochæte was found in twenty-three cases of expulsive alveolo-dental polyarthritis. The organism was unmixed with other micro-organisms in the peripheral portions of the lesions bordering on the healthy tissues. It measures 2 microns in thickness and is 10 by 13 microns in length. Spirals range in number between three and five, and in some cases between seven and nine, though both kinds are thought to belong to the same species.

Original Communications.

PLANT DERMATITIS.

By H. N. Ridley, C.M.G., F.R.S.

It has been well known for many years that the sap or latex of certain plants produces a serious inflammation of the skin when it comes in contact with it. This disease has been called by Greshoff (in "Nuttige Indische Planten") pseudo-erysipelas bullosum. The most poisonous group of plants causing this injury are those of the tropical and subtropical Order *Anacardiaccæ*, of which it may be said that few, if any, are really safe to handle, and most are extremely poisonous. As the effects of poisoning by this group of plants are very distinct from those caused by plants of other Orders such as *Primula obconica* and *Vanilla*, I should suggest that this disease should be called *Dermatitis Anacardiacea*.

The whole order of *Anacardiacea* consists of trees ofteu of large size, and shrubs, mainly occurring in the tropics of both hemispheres, and ranging iuto subtropical or temperate regions, such as southern North America and China.

The poisonous substance lies in a thin, shining, transparent latex exuded from the broken branches and stem of the tree, and frequeutly from the fruit. This latex, which is exuded in very small quantity when a branch is broken, soon turns into a black non-toxic varnish when exposed to the air. The latex of *Rhus vernicifera*, the Japan lac, has been investigated, and is described as a powerful escharotic. The poisonous principle has beeu extracted in the form of a clear, amber-red, viscous or oily liquid with a characteristic odour. One milligram produced very severe blistering when placed on the arm for fifteen minutes. It is not a caustic in the same sense that sulphuric is, as it produces no escharotic effect on the skin of a cadaver. When mixed with water and laccase (the gum enzyme from the latex) in proper proportions and exposed to the air it soon forms the characteristic black non-toxic varnish (Warren, *Pharm Journ.*, October 30, 1909, p. 532). The latex of the other poisonous trees of this Order have not been chemically examined as yet, but there can be little doubt that it will be found to resemble that of *Rhus*.

In the Malay Peninsula the most poisonous of the *Anacardiaceæ* are the trees of the genera *Gluta* and *Melanorrhœa*, which are known to the Malays as Rengas, whence the disease is popularly known as Rengas-poisoning. All species of these two genera are known to be extremely dangerous. The dermatitis is also produced by contact with the latex of *Mangifera odorata*, of the Malay Peninsula; *Pseudosmodingium perniciosum* of Mexico; *Semecarpus Anacardium* of India, and all species of *Rhus* (Sprague, *Journ. Bot.*, 1921, p. 310). The most poisonous of all are the trees of the Malayan genus *Gluta*, of which there are five species in the Malay Peninsula, the commonest of which is *G. coarctata*, a tidal river bush or tree with curious fleshy, rough brown, irregular oval and warty fruits containing a quantity of the poisonous latex.

A travelling European once brought me some fruits of this from Sumatra to ask what it was, and told me he had tasted it. On my inquiring if nothing happened after that, he said that he had had a violent attack of diarrhœa, which he could not account for, some hours later. As the fruit is known to have been used for criminal poisoning by the Malays he was fortunate to have escaped so.

Not only are the fruit, leaves and twigs of *Gluta* and *Melanorrhœa* poisonous, but the timber also, even after being worked up into furniture or used in building, is apt to produce deleterious effects. *Melanorrhœa* has very handsome heart wood, formerly known as Singapore mahogany; it is of a red colour, more or less streaked with black resinous lines. The Kedah Malays on felling a tree, leave it in the forest until the bark and white sap-wood are decayed or removed by termites, after which they said it was safe to remove.

As a furniture wood it went out of fashion, as tables and sideboards, &c., made of it were said to seriously affect many persons on using the rooms which contained them, producing a great irritation of mouth, nose and throat, especially when the furniture got old, worn out and dusty. Dr. Brown (*Journ. Straits Branch, Royal Asiatic Society*, vol. xxiv, p. 83) states that after years of seasoning, when the wood is cut up it gives rise to painful and intractable eruptions on the hands of the workmen.

Action of the Poison.—A good example of the action of the poisonous latex on the human skin was furnished by an accident in the Singapore Botanic Gardens in 1910. A young tree of *Gluta benghas* was broken by the fall of another tree on it, and I ordered its removal. Some of the Javanese coolies said that they were not affected by Rengas-poisoning, and successfully cut the tree to pieces, and carried off the stem and boughs without taking any precaution. Oiling the body with coconut oil is usually adopted to prevent any injury, but they would not wait for this. Of the whole party of about eight or ten men only two were affected. One man who had on previous occasions been poisoned by the Rengas was attacked some hours later after carrying the cut boughs, and experienced the usual irritation of the skin. A boy of about 12 or 14 years old who carried the boughs by the cut end was also poisoned. He did not apparently feel the effects until the evening about twelve hours after, when he experienced much pain and irritation over the whole front of the body, so that he was unable to sleep. Next morning he was still suffering, and I treated him with vaseline well rubbed into the skin on the affected parts. The oil of Sesamum is the usual remedy applied by natives. In former cases I tried the action of lime (chunam), but this did not appear to improve the case at all. After two or three rubbings of vaseline the irritation ceased and gave

no more trouble. The boy was covered with numerous small papules over the face, neck, abdomen and front of the thighs nearly to the knees. The rest of the body, including the genitals, was unaffected. The papules were hardly visible on his brown skin, but easily felt. They did not suppurate or break, and by the next day had quite disappeared. There was no visible œdema in any part, nor any blistering of the skin.

In another case, some years previously, a Javanese coolie was weeding some seedlings of the same species, when he accidentally broke one and, feeling a mosquito on his face, he put up his hand to brush it off. His face very quickly swelled to a great size, and he had to be sent to the hospital for treatment for some days.

Gluta benghas Linn.

Having found a Kwini-Mango tree, *Mangifera odorata*, freshly felled and wanting a specimen of the wood, I sent a Malay man to borrow an axe and cut off a billet. Having done so, he carried it a short distance to my carriage, and I also carried it some way and handled it with impunity, but a few hours afterwards he was attacked by Rengas poisoning, and his arm was swollen for some time.

Dr. Brown in the paper referred to describes the effect of poisoning by *Melanorrhœa curtisii*, a native tree of Penang, as follows: "If the healthy skin is rubbed lightly with the juice from a freshly cut twig, violent smarting and burning pain follows within twenty-four hours and results in a characteristic pustular eruption, an eruption of blebs filled with matter. If the injured surface be of any extent, fever and constitutional disturbance follow the local injury. When a large extent of skin has been affected, as happens when a native with unprotected body struggles through the broken branches, it is said to be so septic that it not infrequently ends fatally." He found that an extract or tincture of the twigs made by soaking them in proof spirit had active blistering properties.

I have seen no case of poisoning by this tree, but I had a Malay affected by pushing through a jungle where there were many young plants of *Melanorrhœa wallichii*, of which he probably broke some in his passage, and was attacked that night by painful swellings of the arms.

I pushed through the same place with him and was not affected at all. Indeed, I have gathered and handled all these plants frequently and never been affected in any way by the latex. I have rubbed the fresh latex of *Gluta rengas* on the back of my hand and wrist, certainly much more than could have been applied to the skin in the Malay weeding the seedlings. The liquid, at first thin and transparent, became of a yellowish colour and finally brown, but nothing more than a faint reddening of the skin resulted.

In the cases above quoted it appears that the hands, although in contact with the latex of the broken or cut branches, are not affected, and that the injury caused to arms, face or body is spread over a much larger area than the part actually in contact with the latex. This is only exuded in very small quantities, and by no means sufficient of itself to cover the whole of the area affected. The boy in the first case mentioned held the cut end of the branches in his hand and dragged them after him. He wore a loose coat and sarong, so that the

branches could not have actually touched the skin of the body, certainly not in any case the lower part of the abdomen and thighs.

Greshoff in "Nuttige Indische Planten" quotes from Upwich (*Gen. Tijdsch. v. Nederl. Ind.*, xxxiv, 795) an account of two whole companies of a military expedition being affected with serious injury to the feet from wading across rivers where Rengas trees (doubtless *Gluta coaretata*) were growing. The fruits falling into the water exuded the latex and so injured their feet.

Immunity.—It is recognized by natives that some persons are unaffected by contact with the latex, while others are severely injured; Warren disputes this statement in the case of *Rhus*, on the ground that one person said to be immune was affected when inoculated by the purified resin. This is hardly a sound argument, as there is a very great difference between being touched by a little latex on the hand and being inoculated with the extracted poisonous principle. It will be noticed that the hand, at least the palm or surface, is not infected, but the poisoning is on the body or face or arms, although these may not have been in actual contact with the latex when exuded from the cut branches, being in the case of the boy protected by the clothes; secondly, that the amount of latex exuded is by no means sufficient to cover the whole of the front of the trunk as in the case of the boy; and thirdly, that in most cases the action does not commence until some hours later, often not until night.

There can be little doubt that in facial and bodily attacks the poison has been conveyed to these parts by the hand which has been in contact with the latex.

May not the action of the poison depend on the amount and character of the perspiration?

I have some reason to believe from observation that those seriously affected by the Rengas are those that sweat most. I, who was never affected by it, rarely if ever perspired visibly in the East, my skin, even after a long march in the sun, always remaining dry and cool. The native, I think, sweats a good deal in the close shut up house at night, but one rarely sees them really perspiring by day. In the case of the boy, the inflammation was from the face downwards in front, running down both thighs, suggesting it followed the course of the perspiration from above downwards. Again, the poisonous oil in *Rhus* is converted into the black non-toxic lac by alkalies. It is possible that in cases where the perspiration is alkaline, the action of the poison is prevented by this conversion into the non-toxic lac.

I call attention to the fact that while the boy, who probably touched his face and upper part of the body, was affected downwards, the natural course of free perspiration, the soldiers in Upwich's case, whose feet touched the poisonous fruits in the river, were only affected in the feet, and not, it appears, upwards.

Remedies.—As alkalies, in the case of *Rhus* at least, convert the oil into the non-toxic resin, their use seems to be indicated. Dr. Brown writes: "The immediate treatment of the poison is generally successful. It should be to wrap the injured part in bandages with some dry alkaline powder, such as bicarbonate of soda, the object being to counteract the acid of the poison and to absorb the exuded secretion from the skin."

I have tried the ordinary chewing lime (chunam) as used by natives, but it was not very successful; vaseline or lard smeared over the hands and bodies of the wood-cutters prevents, says Dr. Brown, the latex from setting up inflammation by forming a protective covering to the skin. Coconut oil or oil of sesamum (til-seed) is what the natives generally use for this. Greshoff recommends the use of dermatol or ichthyol ointment as an application. I have found vaseline gives the best results after the inflammation has set in.

PASSAGES OF MEDICAL INTEREST FROM THE WEST INDIAN NOTE-BOOKS OF DR. LOUIS WESTENRA SAMBON.

(*Continued from p.* 146.)

THE SCOTLAND DISTRICT.

October 18.—At about nine in the morning Dr. Hutson came round with his car to drive us to the parish of St. Andrew, where a young woman had died of pellagra the previous evening. We passed through the Belleville district with its avenue of royal palms, then took the Welches road, hedged by century plants, crossed the railway line, and passed a number of small cabins between which goats and goat-like sheep grazed on the scanty grass. The road was full of women, old and young, running to town with loaded trays on their heads. They carried provisions for sale—tania and yam tubers, large breadfruit, junks of sugar-cane, papaw-melons and avocado pears, together with bottles of "mobi," baskets full of eggs, live fowls, ripe green oranges and golden mangoes. Most of the women were dressed in white calico, while a few wore either blouse or skirt of printed material with pale-coloured stripes or dots. The only bright colouring sported was in the yellow, blue, brown, green and scarlet cross-bars of the Madras tartan handkerchiefs twisted and tied round their heads.

Passing by the Experimental Station, we met some large dark Argentine mules of singular beauty. Had we asked them news of their fathers, they might have made swift straight reply with either fore or hind hoofs, and, certainly, they had no reason to be "silent and ashamed," like the mule in Æsop's fable. They had the size, strength and beauty of their neighing dam, together with the lightness, surefootedness and hardy endurance of their braying sire. They were handsome, like the gaily-tasselled mules portrayed on Assyrian bas-reliefs, fit to carry kings.

We passed sugar-cane fields and large areas covered with pigeon- or Congo-peas (*Cajanus indicus*) raised chiefly as a green-crop manure, to be cut down and ploughed into the soil in order to restore to it the lost nitrogen,[1] which is "bread" to sugar-cane, cotton shrub and cassava plant. Then came cotton plantations with their infinitude of tall, erect, cone-shaped shrubs bearing the leaf of the vine and the flower of the hollyhock. Then followed other vast fields of sugar-cane studded with plots of the highly productive cassava, with clumps of the still more productive banana, dense dark groves of mahogany trees and solitary ceibas (*Eriodendron anfractuosum*) with strangely buttressed trunks, supporting hanging gardens of epiphytes on their level, widespread branches. Suddenly we came face to face with another giant mallow, the Baobab, or "monkey-bread tree" (*Adansonia digitata*), whose immense swollen trunk suggested that even plants might develop the "Barbados leg." Like its near relative the ceiba, the baobab also is a monarch of the open grassland. This one stood by the roadside dangling large, ovoid fruit hanging at the ends of long string-like stems. The fruit contains a slightly acid pulp which is said to be palatable. Major Pedley, in his expedition in search of Mungo Park, lived for twelve days almost exclusively on the fruit of the monkey-bread tree.

We passed Sharon Chapel, a Moravian missionary station, and drove once more between spreading fields of sugar-cane. Reaching a hamlet, the name of which I have forgotten, we were greeted vociferously by a group of women and children clustered round a fountain. They were filling empty kerosene tins with the pure, health-giving waters pumped out of great limestone caves, the very heart-cavities of Barbados, 250 ft. below the surface of the ground, and distributed throughout the island by a perfect system of pipes and hydrants. Only a few yards away, in a hollow of the ground, was one of the filthy ponds from which the natives used to draw their water-supply before 1899.

Soon we left behind us the chattering women and a long row of chattering "Woman's Tongue" trees (*Albizzia lebbek*), but the sugar fields, as we swept by, took up the jabber, whispering first softly, then more loudly, until the whole expanse of vivid green, shimmering in the sunlight, crisped and rustled like a vast silk robe; then, as the breeze increased, the reed waves rippled, murmured, roared like a surging sea, the streamer-leaves fluttering wildly, lashed one another with a sound not unlike the pattering of rain, while far away the young, white, downy tufts on the arrowing canes looked like crests of foam.

Whilst driving through the cane fields we passed the church of the Holy Innocents enshrouded in Casuarina and Frangipani trees, intermingled with great plumose bamboos and flaming crotons.

Halting on the summit of the central ridge, curving round the parishes of St. Joseph and St. Andrew, we commanded a magnificent view of the rugged Scotland district. At our feet stretched the valley of the Scotland River with sugar fields, clumps of trees and scattered cabins on either side of the torrential stream. At the end of the valley lay a wide strip of yellow sand, beyond it the complementary blue of the sea, and a dazzling line of white foam between. From the beach, on our right, rose Chalky Mount, a great knot of contorted ferruginous and calcareous sandstone beds capped with chalk-white silicious sands. Nothing grows here save, in small pocket-like patches, the reed-like *Maranta arundinacea*, from the rhizomes of which arrowroot is made.

The eminence on which we stood was thickly wooded with breadfruit trees and plantains. In front of us a solitary palm rose like a flagstaff, sharply outlined against the ultramarine effulgence of the sea; behind us glittered the emerald expanse of "honied reeds."

The vast semi-circular ridge, with its steep inward slope all furrowed by deep gullies, is not the rim of a volcanic crater, as some had imagined, but a fragment of the broken and submerged range of mountains which, continuing the *Cordillera Oriental* of the Andes, at one time enclosed the Caribbean Sea and made of it a Pacific gulf, or an American Mediterranean. Reared up once more by resultant pressures from subsiding sea-bottoms, the central ridge had emerged from the waves like the back of some huge sea-monster—a chelonia-like monster formed of sandstones, clays and oceanic ooze with, over all, a great carapace of coral limestone.

Of the limestone crust, which now covers about six-sevenths of the surface of the island, only a few scattered patches remain in the Scotland district, the greater part having been removed by the detritic action of the elements which have wrought much destruction on this part of the island.

The height we had ascended was denuded of coral rock, and the soil here consisted of a red argillaceous earth. In other places a white chalky formation covers the ground, while in exposed cuttings along the road these earths are bedded with volcanic ashes from distant eruptive cones and thick layers of a silicious earth composed entirely of the skeletons of sponges, diatomaceæ and radiolarians.

What exquisitely beautiful things are the radiolarian skeletal frameworks! Clusters of infinitely minute spicules of clear glassy silica, arranged with wonderful symmetry and beauty of form into an endless variety of the most complex and intricate patterns. A somewhat vague idea of the elaborate construction and surprising detail of these silicious

[1] It is only within recent years that modern agriculturists have begun to unravel the mysteries of soil fertilization by leguminous plants and the nitrogen-fixing bacteria which live symbiotically in their tuberated roots, but the farmers of Pliny's time knew perfectly well how to enrich the soil with leguminous herbage, while the Chinese from time immemorial have used a mud and clover compost laboriously prepared in large stacks made of alternate layers of legume herbage and canal ooze.

wonderworks may be obtained from the well-known concentric ivory lattice-balls of Canton which, indeed, may be cunningly contrived imitations of radiolarian creations. Perhaps the radiolarian skeletons resemble snow-crystals more nearly than anything else I know. And what a wonderful tale they did unfold, these wonderful atomies!

They were children of the Pacific. In their day, North and South America were asunder while the Pacific waters filled the Caribbean basin. Then arose the narrow isthmus. It united the continents, but separated the oceans, and the fish-tailed Atlantic mermaids bade farewell to the fish-headed mermen of the Pacific with whom they had frolicked for so long. Geologically speaking, this was recent; indeed, the pelagic fauna, both in the Caribbean Sea and in the Gulf of Mexico, is still much more closely related to the fauna of the Pacific than to that of the Atlantic. They were the toilers of the sea-deep, and their multitudinous phosphorescent lights had illumined the abyss for ages and ages. They had fallen thick as snowflakes to the frigid depths of two or three thousand fathoms, but, as legend would have it of Mohammed's tomb, their resting-place had been lifted into the sky a thousand feet above sea-level.

Thus the ridge from the top of which we were looking down upon the placid ocean had been a sea-bottom thousands of fathoms deep, and, as it emerged from the waves wrapped in a sheet of ooze, the "daughters of the sea," or coral-polyps, had encased it in a limestone armour, the parts of which bore hieroglyphics furnishing important chronological data on the Titan's anabasis.

Land and water had actually changed places. The radiolarians told it, the reef-building corals confirmed it, and the sandstones assured us that this astounding interchange had taken place, not once, but many times. The Scotland sandstones were much older than the radiolarians; they were the progeny of great sandstone and granite mountains which had crumbled æons ago. Born of noble sands and grits, compacted and cradled in the ocean, in their turn they had risen from the waters, towered to the clouds, and fought as other Titans had fought before till thundering Jupiter flung them back into the sea. A few had managed to rise again, but they were badly mauled. Those I saw were so maimed and distorted that they reminded me of that famous Rhodesian marble group of Laocoön and his sons found in Rome, in 1506, on the site of the palace of Titus.

I scanned the horizon and looked towards Africa, almost expecting to catch a glimpse of lost Atlantis proudly spanning the ocean, and, whilst I pondered, as though in answer to my thoughts, chattering and laughing negroes approached me, swilling juicy mangoes; with them was a chocolate-coloured lass dragging a woolless, black-bellied Guinea sheep leashed like a dog. I was standing on the western borders of that immense Gondwana continent that once comprised Australia, India, Madagascar, Africa and Brazil.

The ancient Greeks and Romans had understood correctly that fossils represented the remains of animals and plants long disappeared, and that marine forms found on mountains indicated changes in the location of land and water. Aristotle tells us explicitly that "the world does not always present to us the same aspect; here, where we are to-day treading the soil of a continent, the sea has flowed and will flow again; the region where the sea flows now has once been and will again be a continent." A greater darkness than that of the abysmal waters enveloped the Old World during the Middle Ages, and thus pelagic fossils were looked upon as sports of Nature, as curious imitations of plants and animals produced in rocks by a myterious *vis plastica*. It was the great Italian painter, architect and sculptor, Leonardo da Vinci, who reasserted that petrified shells once had contained living animals. "They tell us," he says, "that these shells were formed in the hills by the influence of the stars; but, I ask, where in the hills are the stars now forming shells of different ages and species?" In 1517, Girolamo Fracastoro, a physician of Verona, who wrote a famous poem on the most unpoetic subject of syphilis and, in 1580, Bernard Palissy, the celebrated French potter, whose "*pièces rustiques*"[1] are well-known objects of art, clearly explained this wonderful and awe-inspiring fact. These wise, farseeing (aye, and fearless) men showed that the imprints or remains of shells and fish-bones found embedded in certain rocks had belonged once to marine animals, that such animals, on account of their abundance, distribution and association, must have lived and died in the localities in which subsequently they were found petrified, and that, therefore, in their lifetime the said localities must have been lying beneath the sea.

It seemed strange to me that these testimonies, and the facts on which they are based, still should be a matter of dispute among scientists. The battle between "diluvialists" and "anti-diluvialists" which had raged throughout the seventeenth and eighteenth centuries were as inane as the one more recently fought by contagionists and non-contagionists over the epidemiology of yellow fever. The mistake of the diluvialists was that they read only a paper edition of the Book of Genesis, varied by innumerable successive transcriptions and translations made by careless slaves and conceited scribes, from baked clay tablets, papyrus rolls and vellum codices, each one with further omissions, greater errors and more impudent perversions, instead of reading God's own stone-book, open beneath the lights of heaven for all to read.

At many points round the island, some distance from the coast, one could see the breakers foaming furiously over the barrier reefs on which countless hosts of polyps were building new terraces further to raise aloft their proud structure, which.

[1] Large faience dishes of sombre colour, decorated with relief figures of fish, frogs, lizards and fossil shells of the Paris basin.

like the Sumerian "Tower of Tongues," shall never reach the heavens.

A Coral Bed.

A coral bed is a sight worth seeing. We all know the beautiful skeletons of coral animals as they appear in museum show-cases, or in the drawing-room cabinet by the side of Capo-di-Monte bisquit figures and Venetian rose-point lace. We may have admired the delicate tracery of the sea-fan, the curious convolutions of the brain-stone, or the heather-like appearance of a tufted branching coral; but these are mere fragments of white porous rock. They can no more suggest the glowing live corals, in their fairyland beneath the waves, than bleached avian skeletons can give any idea of the elegant forms and gorgeous colours of living birds, such as the peacock, the quezal, the gold pheasant, the blue bird of paradise, the fiery topaz and other feathered glories, flying, courting, warbling, tourneying and dancing in their native forests.

Approach the reef, peer into the kaleidoscope of liquid crystal, and you shall see the wonder of wonders. Maybe you will dive straight away into the deep, as Glaucus did, because the fascination of the "daughters of the sea" is irresistible. Here the living corals are all ablaze with brilliant colours, as if they had been glazed with frits and fluxes more splendid than any that ever flashed over Egyptian amulets, Saracenic azulejos, or the loving-cups of Maestro Giorgio Andreoli of Gubbio.

If you dive into the salt water, the great coral patches on the white sand look like smudges of the brightest pigments on a gigantic porcelain palette, but an affrighted squid may suddenly darken the water with a cloud of ink spurted out of its funnel. Nature mockingly offers the materials wherewith to portray—yea, the very ink used by Homer, Lucretius, Virgil and Ovid in their masterly word-paintings; but the infinity of objects, so varied, strange and fantastic in appearance, so complex and intricate in form, so rich and diverse in colour, all waving, creeping, darting, swimming, gyrating, eddying, appearing and disappearing, ever-changing tint and shape, confuse the eye, bewilder the mind and defy description. "*Hatsmou missaper*," says the Psalmist, "They are more than can be counted."

Chalky Mount.

One poor dropsical little girl, probably a case of hookworm disease, had been swathed by her mother in sour-sop (*Anona muricata*) leaves smeared with castor-oil, kept in place by multi-coloured rags. The father, a potter, took great pride in showing us his primitive wheel, his extemporary kiln and the "juglets," "monkeys," and other vessels which he had made out of the fine sandy clays of the Scotland district.

Clambering to the summit of Chalky Mount, we enjoyed the vista that opens between its horns—a blaze of sea and sky blues seen from an aerie made of ochreous rocks presenting every possible tint and mixture of yellow and red, variegated by the different green hues of arrowroot plots, opuntia patches and cashew and mango clumps. Then we descended to the beach through a narrow, precipitous gorge and, on our way to the St. Andrew's Almshouse, examined the lower stretch of "The River." Here, to our surprise, we found the water and the water-side plants besmeared with rock-oil as though the rivulet had been some Panama stream under the care of Le Prince. Later we discovered that the oiling is natural. Petroleum occurs plentifully in the clays and sandstones of the Scotland district—one of the reasons, perhaps, why anopheline mosquitoes and malaria are unknown in Barbados.

The West Indian Goat-like Sheep.

Heavily-woolled sheep have been transported often from Europe to the West Indies, but they are ill-suited to the warm climate and do not thrive in their winter clothing. However, the Antilles possess a hardy, active, smooth-coated sheep of antelopian type, characterized by long legs, short tail, large, drooping ears, absence of horns in both sexes, and fur of short hair, fox-red or fawn above, brown or jet-black on face, belly and legs. This breed, the "Barbados woolless sheep," produces excellent mutton, and is cultivated not only in Barbados, but also in Antigua, St. Lucia, Tortola, Anguilla and other islands. It is not kept in flocks, but singly, after the manner of goats, each peasant proprietor possessing one or two, usually tethered to pegs and feeding on the scanty herbage. Probably it came from the West Coast of Africa, where we find a long-limbed type (*Ovis longipes*) exactly like it: it was imported at an early date by slave-traders, who carried away Guinea sheep as sea-stock along with their human cattle. Ligon, in his "History of Barbados," published in 1657, says: "Other sheep we have there which are brought from Guinny and Binny, and those have hair growing on them instead of wool; and liker goats than sheep, yet their flesh is tasted more like mutton than the other."

The West Indian long-limbed sheep have often been crossed with other breeds from Europe or America, and show a tendency to develop wool which forms great unsightly patches over their backs, shoulders, crops and upper ribs, with detached flakes hanging loosely about. They look like goats wearing door-mats, and remind one of the "*oves pellitæ*" or "*oves tectæ*" of ancient Attica and Epirus, with skins buckled over them to protect their soft and valuable fleeces. In the Guinea race the males have small horns, but in the Barbadian breed both sexes are, as a rule, destitute of armature. According to Lydekker, the Hairy Sheep of West Africa have no relationship to the Barbary Wild Sheep, but may have been reclaimed either from the Asiatic Urial (*Ovis vignei*) or from the European Mouflon (*Ovis musimon*). Be that as it may, woolless sheep are

certainly of long standing in Ethiopia. Already in the first century of our era, Straho informs us that the Ethiopians "wear sheep-skins without wool, because their sheep have hair like goats." Prohahly the Guinea sheep were imported originally from Syria, Anatolia, Cyprus, or Baetica hy the Phœnician colonists of the African west coast. The Baetica sheep were famous for their gold-hrown fleeces, some almost ferruginous, a colour which Virgil termed "Spanish rust."

The change from wool to hair has been ohserved often in sheep transported from cold to hot climates, and is hut an intensification of the seasonal change of pelage. It is said to occur after the third generation, hoth on the west coast of Africa and in the West Indies. The black colouring of the under parts in the West African and West Indian sheep is explained hy an expansion of the hlack hand which, in the Mouflon, divides the white of the helly from the rufus of the flanks.

The earlier domesticated sheep, like their wild ascendants, must have heen either fawn or chestnut, with dark lines and patches. Such colours were acceptahle to the ancients, hecause they were permanent and saved the trouble and expense of dyeing. But the snow-white fleece soon came to be more valued; it was not only pleasing to the eye, but well fitted to receive the most beautiful and delicate dyes, the splendour of the Tyrian purple. Once the demand was established white fleeces abounded, and it is interesting to note how soon human ingenuity succeeded hoth in discovering the laws which govern the inheritance of characteristics and in mastering the principles and methods of scientific hreeding. Pliny, Varro, Virgil, Columella state that, no matter how white the fleece, the ram's mouth should be examined carefully, because the slightest mark of pigment on tongue or palate betrays a latent character which would soon spell coloured wool in the offspring. Strabo informs us that Laodicean shepherds were every whit as careful with regard to the hreeding of their famous hlack sheep. One cannot read the thirtieth Book of Genesis without being struck hy Jacoh's skill in the rearing of stock, and without admitting that Mendel had a cunning anticipator thirty-six centuries ago.

Dr. Archer's Garden.

After showing us his patients, Dr. Archer took us round to look at his mangoes—over two thousand young, rohust stock-trees "in-arched" with eighteen-months-old seedlings of the hest Indian, Malavan and Creole varieties. Amongst other useful plants, I saw the West Indian "Almond," the Jamaican Cedar, Barbadoes Cherry, Fustic, Mammea apple and the Guaiacum. The Guaiacum is still held to he valuahle. Thomas Pavnel—a Merton Abhey canon of the sixteenth century—savs: "It healeth the Frenche Pockes and also helpeth the gout in the feet, the stoone, the palsey, lepree, dropsy, fallynge euyll, and other dyseases." I made the acquaintance also of *Gliricidum maculatum*, a true vegetahle agriculturist, usually met with in sour-grass fields, scattering his fertilizer-petals, which same contain a high percentage of nitrogen. I held up to my nostrils the fragrant leaves of the Lemon grass (*Andropogon citratus*), the attar of which is used in the manufacture of eau-de-Cologne and the perfuming of soaps, such as "honey-soap." The West Indians make an infusion of lemon-grass leaves, and value it greatly as a carminative, diaphoretic and stimulant.

The garden was simply a jewel of hrilliant enamels. I rememher a Corallita mingling its snow-white inflorescence with the golden rain of a Cassia, a Petræa spreading royal sheets of purple over the entrance arch, a lovely Ipomea decorating the house-veranda with deep crimson flowers and, among the masses of sap green and emerald green, great dahs of Allamanda yellow and Hihiscus scarlet.

Within the house, the tropical flora took the shape of handsome furniture made of Cordia, Sapodilla, Mahogany, Guaiacum, Mammea and other heautiful and durable timbers such as would delight the heart of a cahinet maker.

Denmark Fort.

Dr. Greenidge entertained us to luncheon at his charming residence, and then drove us to the old Denmark Fort, Speightstown, where the gunners' quarters had heen converted into an almshouse. The fort stands at the very edge of the sea, screened hy two silk-cotton trees and many cocoanut palms, each wearing a wide metal helt round its stem to prevent rats from climhing up and stealing the young nuts. Beneath the shade of the Ceihas lie three old cannon with their muzzles still trained on the inky-hlue sea. They are battered old tars now, but doggedly have they fought in their day. Children love to bestride them and gather about their mountings. Do the old snitfires reallv tell them tales of the glorious exploits of De Ruyter and De Grasse, Ayscue, Rodney and Nelson?

(To be continued.)

Neuro-recurrences following Treatment with Arsphenamin (Ernest L. Zimmermann, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 6, June, 1922).—A series of thirty-nine neuro-recurrences are tahulated. Their symptomatology, genesis and prognosis are discussed. Pathologicallv there are two types, a diffuse meningovascular process and a process limited to one or more focalized lesions. In the former the spinal fluid is always ahnormal; in the latter it may show marked abnormalities or mav he entirely normal.

Prophylaxis of such lesions depends on a thorough mercurial treatment. It seems immaterial whether mercury is administered during or immediately following a course of arsphenamin.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JULY 15, 1922.

THE DEVELOPMENT OF SCIENTIFIC NURSING AND ITS BEGINNINGS IN TROPICAL COUNTRIES.

HAND in hand with advances in surgery, medicine, sanitation and hygiene in all their phases we find in every corner of the earth a corresponding improvement in the care of the sick, the administration of the nursing departments, the betterment of all conditions of the staff, be it porters, maids, the kitchen and cooking, and the method of handling the out-patients, who after all form the most numerous of our hospital patients.

Through the ages, the care of the sick in hospitals and in their own homes by visiting nurses formed part of the history of every country both before and after the commencement of the Christian era. Splendid organizations were to hand amongst Jews and Gentiles, pagan and organized communities figure prominently in literature, and were the performance on a level with the pictured drawings, and the palatial environment afforded the sick, the ancient would appear to outstrip modern hospitals in well-nigh every branch of work. Everything in the great towns of ancient Alexandria, Baghdad, Damascus, in the great Arab hospitals of mediæval Spain, was to hand that money could purchase, that philanthropy could devise—that religious and pious communities could think of was heaped upon the sick and injured. Everything—and yet from the purely scientific point of view, nothing. Philanthropy, humanity, all the virtues were there, but philanthropy alone did not and never will constitute anything but a comfortable place to rest and as often as not to die in and calculated to hasten the end by being sent for treatment thereto. There was a hiatus somewhere, there was wanting something that money could not buy nor religion supply. Knowledge was the element that was not forthcoming; ignorance prevailed, and without knowledge the so-called hospital became more often a pest house than a sanatorium. The branch of knowledge amiss was medicine. The art of medicine even was despicable, the science of medicine was unborn, and without the combination of the two a hospital is but a charterhouse of death, although it may and did stand out as an emblem of noble men and women devoting money, time, piety, fervency in religion to the benefit of their fellow man, yet the kernel was undiscovered, and the jewel of great price lay hidden.

The teaching of Moses gave us ten commandments for personal and family and social guidance, and his masterly management of camp life and sanitation created a precedent for all time, faultless in his teaching whether in the religious or physical senses. But human beings ceased to be merely nomad dwellers and took to town life and settled abodes on the soil without guidance and knowledge fitting them for such a life, and even as tilled agricultural land tends to become choked by weeds, so inhabited soil becomes polluted by human beings. We read of the great so-called hygienic efforts of men in mediæval times, of their lavish expenditure on hospitals for the people. What did it lead to through all the ages of their endeavour? An operation ward in 1872 in a central London hospital attended by the writer, where, in the post-operation ward, 17 men were placed for after treatment, all suffered from blood poisoning—erysipelas, phlegmonous erysipelas, cellulitis, suppurative phlebitis, and such other semi-scientific names as fancy

directed. Thirteen of the 17 men died, a tale not of the dark ages, but of yesterday, which was well known in European hospitals of the seventies and up to the time of the advent of Lister's teaching. The tale emanates not from a slum, nor a carelessly administered or inadequately nursed hospital, but from a hospital of recent building, and the nursing staff was one of the most modern of Miss Nightingale's immediately and directly supervised. It is not money, it is even nothing to do with the highest phase of nursing, but with ignorance of hygiene in the Listerian sense that has crippled all scientific nursing up to quite recent years. When organization was perfected by Florence Nightingale and nurses trained under her regime the hospital world stood ready for Listerian methods, and by its adoption nursing as a science and art has been perfected. Further additions are mere matters of detail, of improved organization, but the firm basis for all time has been laid and firmly established. The nursing at home once rooted, it was but a process of time to find its benefits gradually extend to the tropics. In the first place the British hospital nurse became and is now the model on which all modern hospital nursing is founded. In the Great War that fact was acknowledged by the nations, and the British hospital nurse came into her own. Gradually have the Crown colonies and the protectorates of the Empire come into line. Even in one up-to-date colony such as Hong Kong, the evolution took time; in 1889 in the Civil Hospital of Hong Kong Chinese coolies acted as nurses, and as ward orderlies carried out such nursing as there was. Intelligent orderlies they were, and in many instances kindly and competent. The writer brought out the first trained nurse to Hong Kong for civil work in his practice. The then Governor of Hong Kong had not seen British nurses in the colonies he had already governed, namely, in the West Indies and in the Pacific. He could not understand British women nursing natives, and hesitated bringing them to the Civil Hospital. He thought that a body of women required religious governance and fervour to keep them together, and he experimented with Catholic sisters from Saigon, where, under the French regime, sisters from convents did the nursing. A number were brought from Saigon to Hong Kong and planted in the hospital. These women had had no training as nurses. The operating theatre and its technicalities were unknown to them, and their religious training forbade them to attend men in the ordinary positions and exposures of the operating table. Moreover, they knew no English, to the surgical and medical staff they were as dumb and incapable handmaidens. They could not converse with the Chinese, even "pigeon English" was an unknown means of communication, so that these French untrained sisters, sweet and kindly women as they were, found their situation impossible, and they were allowed to retire. The one British nurse in the colony, however, had found favour at Government House, and her example turned the Governor's belief to his own countrywomen, and six fully trained nurses were recruited at home and, under a matron in charge, took up the work of nursing the Civil Hospital, to the great advantage of the patient, the satisfaction of the medical service of the colony, and the comfort of the community. The excellent example set by them established modern nursing throughout our Colonial Empire. A few centres of the kind will also serve to train native nurses, and this is being fairly regularly done. Anglo-Indian, Anglo-Chinese, Anglo-African girls make particularly good nurses; they are usually tractable, fairly educated and kindly. They know English as a rule, and therefore can read suitable text-books, and should in time serve to supply local nurses on European lines, to the great benefit of the European communities, and to the Anglo-Indian households. A great step has lately been taken in the formation of a College of Nursing in London. It was originally thought of by the writer, as a companion College to that of the College of Ambulance, and it was brought into being by the Hon. Sir Arthur Stanley, G.B.E., and is now being built. It will raise the subject of nursing into a Department; it will place the Nurse's certificate to the level of a diploma of nursing, and in time, as the College of Surgeons and College of Physicians grant their diplomas, so the College of Nursing will in time no doubt confer one. The nurse will be upheld and the profession of nursing will be raised from the very indefinite position it holds at present; and the College will become as an alma mater for her devotees, and shelter for the nurse and her prerogatives. It is a branch of woman's real calling with which the world will have sympathy and will grant support. It is woman's duty, not man's; it is no infringement of man's long established prerogative in surgery and medicine, and woman placed as man would wish to see her, and heart and soul he will favour the alma mater which is now being raised for her honour and for the benefit of mankind.

Those who are interested in the history of nursing —and who are not?—will read that most admirable book, "A History of Nursing," by M. Adelaide Nutting, R.N., and Lavinia L. Dock, R.N., in two volumes, illustrated and published by G. P. Putnam's Sons, New York and London. Between them these ladies have for some 15 years patiently collected material relating to nursing and its history. Part I is devoted to the Pre-Christian Period; Part II deals with the period subsequent to that date until the date of the introduction of so-called modern nursing of to-day. The latter includes what is commonly styled the darkest known period in the history of nursing, namely, from the latter part of the 17th up to the middle of the 19th century. Then was the period of lasting stagnation, when city hospitals were little better than city prisons, where the sun was shut out, where the dismal wards were overcrowded and became "black holes," which were well nigh on a level with that of Calcutta of historic fame, where patients were deprived of all comforts, and even of necessaries, where man directed matters and woman was given no power. J. C.

Annotations.

Virulence of a Micro-organism and its Independence on the Culture Medium (Lt.-Col. W. F. Harvey and Capt. K. R. K. Iyengar, *Indian Journal of Medical Research*, vol. ix, No. 4, April, 1922).—*Bacillus avisepticus* is an organism whose virulence can be maintained fixed within small limits without animal passage, by sub-culture on blood agar, while its virulence is very largely lost by sub-culture on ordinary agar.

There seems some probability that *B. avisepticus* when sub-cultured on ordinary agar becomes "fixed" in avirulence.

Experimental Ingestion of the Ova of Fasciolopsis buski; also the Ingestion of Adult Fasciolopsis buski for the Purpose of Artificial Infestation (C. H. Barton, *Journal of Parasitology*, vol. viii, No. 1, September, 1921).—Ungested ova appear in the normal stool as early as two and a half hours after being swallowed in gelatin capsules. Patients become ova-free in from one to eight days without the use of carthartics, and in from ten hours to two days after free cartharsis. After swallowing two live flukes which did not become parasitic, ova appeared in eighteen hours and disappeared in seventy-one hours. Twenty-eight hours after swallowing three live flukes, one of which lodged and became parasitic, ova appeared in the stool, and did not again disappear till a year later, when an anthelmintic was taken and the adult fluke was expelled. Some growth is noted in the fluke which stayed in, but the growth is less than might be expected over a period of more than a year. Eggs obtained from a single fluke infestation are fertile, and have been hatched and the miracidium studied.

A Study of Trypanosoma americanum (R. W. Glaser, *Journal of Parasitology*, vol. viii, No. 3, March, 1922)—*Trypanosoma americanum* was successfully grown in horse blood medium and on the N.N.N. medium, as well as in cow blood medium. Development in the culture media was traced, and the cytological details of the various stages described.

T. americanum is specific to cattle. In freshly drawn blood and in very early cultures *T. americanum* resembles the majority of the forms found in three- and four-day-old cultures.

Morphological and experimental data are presented to show that *T. americanum* is structurally a Crithidium. Prolonged culture and environment alterations have a tendency to produce herpetomonad types, but never trypanosome types.

Reasons are presented in support of the view that *T. americanum* is an intermediate evolutionary stage between true Crithidia and true trypanosomes. The name *Trypanosoma americanum* is retained.

To-day's Problem in Diabetes (Elliott P. Joslin, *Journal of the American Medical Association*, vol. lxxviii, No. 20, May, 1922).—Whereas the death-rate from diabetes in the Massachusetts General Hospital for the ninety years prior to 1914 averaged 28 per cent., since that date it has fallen to 7 per cent. In order to determine whether such a change in duration was confined to hospital cases, a study was made of the fatal cases of diabetes occurring in the city of Boston. The registrar's office showed that between 1895 and 1913 the average duration of life in fatal cases of diabetes amounted to 3·3 years, for 1915 it was 4·3 years, and for 1920 it was 5·3 years. These figures are significant in several ways. Since the average duration of life of diabetic patients as at present treated by the average Boston physician is 5·3 years, it is fair in considering claims of any new method of treatment to demand that it give as good or better results.

Non-parasitic Cysts of the Liver (David B. Allman, *Journal of the American Medical Association*, vol. lxxviii, No. 20, May, 1922).—Solitary non-parasitic hepatic cysts are extremely rare. They are found only in women.

The diagnosis is only by inference, as they present no peculiar symptoms.

Simple drainage will usually effect a cure.

Non-specific Protein Therapy (Edward Ahlswede, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 5, May, 1922).—The injections of a germ and toxin-free solution of milk albumin is indicated in all local and generalized infections, in acute and chronic staphylococcus disease of the skin (furunculosis, pyoderma, &c.) in superficial and deep trichophytia, in buhoes, gonorrhœic complications, carbuncles, and cases of chronic suppuration. Milk albumen injections are indicated, furthermore, in cases of acute infectious diseases and anæmias. The injections are best made into the buttocks (similarly to mercuric injections. Avoid the vessels). No hard and fast rules can be laid down concerning the number of the injections and the interval between each two injections.

Description of an Apparatus for Isolating Infective Hookworm Larvæ from Soil (W. W. Cort, Ph.D.; J. E. Ackert, Ph.D.; D. L. Augustine, B.S.; and F. K. Payne, M.D., *American Journal of Hygiene*, vol. ii, No. 1, January, 1922).—The apparatus for isolating hookworm larvæ from soil, described in this paper, which is similar to an apparatus devised by Baermann, makes it possible to isolate hookworm larvæ from considerable quantities of soil. It is possible to distinguish mature hookworm larvæ, both sheathed and unsheathed, from other nematodes found in soil, by their

characteristic structure and movement. For experiments with the isolating apparatus mature hookworm larvæ were obtained by spreading fæces containing hookworm eggs on soil in large pans and covering this with a thin layer of ashes.

Experiments to standardize the isolating apparatus showed (1) that to isolate a satisfactory percentage of the larvæ the water must be at least 10° F. warmer than the soil; (2) that a slightly higher percentage of larvæ can be isolated from moist than saturated soil; (3) that in soil with very finely divided particles the percentage of larvæ which can be isolated is less than in coarser soils; and (4) that while most of the larvæ escape from the soil into the water, in the first six hours, an appreciable number come out after this time.

It is probable that the passage of the larvæ from the soil to the water is not a reaction to moisture or a higher temperature, but is brought about by the active larvæ falling through spaces in the soil until they reach the water. The isolating apparatus makes possible the study of soil nematodes, both free living and the larvæ of parasitic species, in their natural environment, and can be utilized in investigating the sources of human infestation in hookworm control work.

Tincture of Garlic in Gangrene of the Lung (Prof. Roch, *Revue Med. de la Suisse Romande*, p. 65).—The case was a farm labourer who was sent to hospital on November 17. Inhalation of chaff from the threshing machine had caused coughing and abundant muco-purulent expectoration.

Over the whole of the upper half of the right lung there was dullness, tubular breathing and numerous sub-crepitant râles were heard, and radioscopy showed complete obscurity. At the right base behind dullness and pleural friction were found. The expectoration was so fœtid as to leave no doubt as to the diagnosis. On standing it showed the three characteristic layers, and microscopically a rich and varied flora, aerobic and anaerobic, but no tubercle bacilli were found. A particle of gangrenous lung of the size of a pea was discovered. The temperature was irregular, reaching 102 or more in the evening. There was abundant perspiration, and the patient's colour was leaden. The heart and other organs appeared to be acting well. The prognosis was made desperate by the rapid progress of the disease.

Treatment.—Artificial pneumothorax was not adopted owing to the signs of dry pleurisy. Tincture of garlic, which has been used with success in other similar cases, was tried.

The patient was getting worse in every way—various balsams and creosote being tried without result. On December 2 *tincture of garlic* (strength 1 in 5) was given in small doses, and from December 7 to the extent of sixty drops daily, in three doses. Improvement immediately began—temperature usually normal, sputum diminished, râles became rare, perspiration ceased, appetite, good weight increased. Owing to interrupted treatment, a fresh attack of hæmoptysis occurred, and the temperature rose to 100°. Tincture of garlic was given in doses of twenty drops twice daily, and immediately expectoration diminished and the temperature became normal. Recovery took place, but there remained at the base signs of thickened pleura, and at the apex sclerosis surrounding a dry cavity. In the mornings there was a little muco-purulent expectoration without odour.

The tincture of garlic is easily prepared in a strength of 1 in 5 or 1 in 10 by macerating the dried bulbs in 95 per cent. alcohol for a fortnight and filtering.

The writer considers that tincture of garlic should be useful in various broncho-pulmonary affections besides gangrene—fœtid bronchitis, bronchiectasis, chronic tuberculosis with secondary infections, &c.

Abstracts and Reprints.

THE PHYSICAL TREATMENT OF ENTEROPTOSIS.[1]

By Cortlandt MacMahon, M.A.Oxon.

If enteroptosis is treated in its early stages no artificial support should be necessary, but a well-fitting belt will give considerable comfort in a severe case; the fact, however, that unless physically exercised, the abdominal muscles must become gradually weaker, and the weight of the viscera thrown more into the belt should be carefully considered, and, if a belt is worn, the exercises are just as necessary. By degrees the belt should be discontinued for intervals, and possibly some day it can be discontinued. It would, however, be unwise to leave it off during a long day's shooting or golfing, for over-exhaustion might easily cause a weakness of the support given to the muscles which had not got back their full tonicity, and a temporary relapse might occur. The patient must learn that any slack posture of the body when either standing or sitting is dangerous, and the lazy way in which so many people sit when at meals is quite enough to aggravate the symptoms of enteroptosis. When standing or walking, the body should lean a little forward from the hips and the shoulders should be pressed back. This movement raises the upper chest a little if the rectus muscle of the abdomen, strengthened by exercise, is slightly contracted. The lower ribs by training are permanently well expanded, and the support of the viscera is assured.

The chief exercises used are as follows: All the early exercises are done in a recumbent position. Each exercise is carried out eighteen times. This

[1] Abstracted from *The Practitioner*, October, 1921.

will not exhaust the patient, if a rest is taken after six movements of each exercise.

Description of Exercises.

(1) The operator places his hand on the lower ribs on a line with the bottom of the breast-bone. The patient breathes in strongly, and the lower ribs are forced outwards. When the fullest expansion has been made the patient breathes out quickly.

(2) The same movement is made, but the breath is taken in three distinct movements, and the greatest expansion occurs on the third movement.

(3) The muscles of the abdomen are contracted in three separate movements as a physical act only. The operator helps the contraction by gently pressing on the lower portion of the abdomen.

(4) The lower ribs are expanded on the act of inspiration, and without a pause the air is expelled from the lungs by a powerful contraction of the abdominal muscles.

(5) The same movements, but the air is expelled in three to five separate contractions of the abdominal wall.

(6) The lower ribs are expanded as before, but the breath is now held, and the abdominal muscles are contracted slowly and powerfully, at first with one contraction of the abdominal muscles and by degrees up to five contractions. The lower ribs must be strongly expanded during this exercise, and the operator must help the ascent of the viscera by a steady upward pressure on the lower portion of the abdomen. This exercise gives the greatest expansion of the lower ribs.

Further exercises are given which generally tone up the muscles of the body.

In a fairly young or middle-aged patient, when the condition is not severe, six to twelve treatments are quite sufficient, the patient carrying out the exercises, as shown, during and after treatment. It is very necessary to impart great confidence and optimism to the patient as to the prospect of rapid improvement and eventual recovery, which is quite justified, as one knows from the doctor who has advised the physical treatment, that no organic disease is suspected.

SCURVY IN ADULTS.[1]

By W. J. Richard and W. D. Mackinnon.

It is a common impression that scurvy is but rarely found in adults in this country, but it is not the authors' experience. At the Govan and Edinburgh poorhouses they have frequently seen cases of scurvy. None of the cases were diagnosed "scurvy" previous to admission. All the cases were in males, the majority of whom lived in model lodging-houses, where they bought and cooked their own food. The remainder lived alone in houses under practically the same conditions. All were unskilled labourers, not in constant employment. Their ages ranged from 21 to 72. Most of the cases occurred in May to July, the season when fresh vegetables are dear. Moreover, when a man has to cook his own food he may not be bothered with cooking vegetables, and his flesh food is always fried. As a rule, these patients had been living, for long periods, on a diet mainly of tea, bread and margarine, sausage, ham and tinned meats. Frying was the favourite method of cooking, and as this requires a very high temperature any vitamines in the food are destroyed.

The earliest symptoms were pain, stiffness and discoloration of the legs. For some time most of the patients had felt weak and apathetic. In a few cases there was breathlessness and vertigo after exertion.

Examination showed patches, purplish in colour, with deep swelling, which felt brawny and elastic over the calves, extending in a few to the popliteal region, and even up the posterior aspect of the thigh. In two cases these swellings were so tense that they caused flexion of the legs. Commonly, there was swelling and discoloration on both sides of the tendo Achillis extending below and behind the malleoli, and even on to the dorsum of the foot on the outer side. There frequently was also considerable œdema round the ankle-joints. In addition, dark purple or crimson petechiæ were were noted on the peroneal aspects of the legs, on the insides of the knees, and on the inner aspects of the thigh; in a few cases on the lower abdomen. These petechiæ raised the hair follicles, giving the impression to touch of "cutis anserina." The skin was dry and rough, and of an ashy-grey appearance. On most of the cases the complexion was of a peculiarly sallow tint. All the patients complained of cramping pains in the legs, and most of them had pains in the gluteal muscles, and tenderness over the shins in the middle three-fifths of the tibia. In one case there were several ulcers over a patch of ecchymosis, showing dark crimson, exuberant granulations which bled readily on the least irritation.

The gums were spongy and swollen, dark purple or red, tender to touch, and bled easily. Between the teeth the margins of the gums were hypertrophied and frequently ulcerating, while the necks of the teeth in front and behind were exposed. Pyorrhœa was frequent. In one patient who was edentulous, the gums were firm and slaty-bluish, while on the right side of the palate a patch of ecchymosis extended from the margin of the gum almost to the midline. The tongue in some cases was moist and clean; in others it was dry and fissured, with a slight yellowish fur at the back. The breath had a musty, fœtid odour.

The eyelids in many were swollen, and in a few were thick and heavy, giving the appearance of ptosis. The conjunctivæ, as a rule, were injected, while several patients had changes in the lens. Nebulæ of the cornea were seen in a number of cases, and two had night-blindness.

The heart sounds were weak, and a soft systolic murmur over the aortic area was heard. In two

[1] Abstracted from the *Glasgow Medical Journal*, 1921.

cases a hæmic murmur was heard over the jugular vein at the root of the neck. In eight cases a blood-count was made, and showed that the red blood corpuscles were not diminished to any extent, but the colour-index was low, usually about 0·5. The white blood corpuscles were about 4-5,000; the polymorph. nutrophiles being about 80 per cent.; eosinophiles, 4 per cent.; and lymphocytes, 16 per cent. Of the latter, about 20 per cent. were large mononuclears. Indican was constantly present in the urine, and albumin in a number of cases.

The treatment was very simple—rest in bed with ordinary hospital diet, abundance of green vegetables, lemon, malt, and cod-liver oil; and, later, tonics containing iron and arsenic. Antiseptic mouth-washes were used. In a fortnight the more prominent symptoms disappeared. The swelling and discoloration disappeared from upwards, the patches at the ankles and over the popliteal spaces being the most persistent. The pains in the legs and tenderness over the shins vanished early, but the stiffness of the legs was the last to go. After the discoloration had faded, a crepitant sensation on pinching the calves could long be felt. In a month, or at most six weeks, recovery was complete.

ICTERUS DUE TO ASCARIDES.[1]

By H. Bourges.

Hæmolytic icterus may occur in infections such syphilis, tuberculosis and malaria, or in poisoning by lead, chloroform and other substances. It does not appear to have been observed in ascaridiasis, though a case in which it occurred in ankylostomiasis has been recorded.

A young soldier of the colonial infantry was admitted to hospital on January 4, 1916, for anæmia, weakness and splenic hypertrophy. For some time he had suffered from passing febrile attacks without apparent cause.

On examination he was found to be wasted, and there was pallor of skin and mucous membranes with subicteric tint in the conjunctivæ. The stools were not decolorized. The spleen was enlarged and tender on palpation. The urine did not contain biliary acids or pigment, but urobilin in large amount. There was no fever at the time. Blood examination showed red corpuscles, 3,350,000, and white 16,000, of which 58 per cent. were polynuclear neutrophiles, seven eosinophiles, and thirty-five mononuclears. There were a few myelocytes and nucleated red corpuscles. The "fragility" of the red corpuscles was increased. The Wassermann reaction was negative.

Two ascarides were passed spontaneously. This fact, with the eosinophilia, led to administration of santonin for three days, which was followed by the passage of thirteen ascarides. But the state of the patient was not much altered. A new series of santonin doses was at intervals of eight days followed by expulsion of fourteen ascarides. Then the patient gradually improved. The pallor decreased and the conjunctivæ lost their subicteric tint, the spleen diminished, strength was regained, and appetite returned. Two months after the first examination the blood showed: Red corpuscles, 4,455,000; white, 10,000, of which 53 per cent. were polynuclear neutrophiles and forty-seven mononuclears. The "globular" resistance of the red corpuscles had increased.

Thus the patient was admitted with a complete hæmolytic syndrome, which disappeared under the administration of santonin. The destruction of red corpuscles could not be attributed to syphilis, tuberculosis or malaria, or other recognized cause. The only suggestion was the ascaridiasis, and this was borne out by the result of treatment.

Ascaridiasis is now regarded as an intoxication. The chemical composition of the parasites has been investigated. They contain free fatty acids, aldehydes, ether-salts, and a compound previously unknown, ascaryl alcohol. Similarly, in their excretions have been found fatty acids, aldehydes, mercaptans and ammonia. These substances not only are irritants of the mucous membrane, but on absorption produce the nervous symptoms frequently observed in those who harbour ascarides. According to Fury, the non-saturated fatty acids, such as oleic and acrylic acids, are destroyers of the red corpuscles. In the case of ankylostomiasis mentioned above, the icterus was also hæmolytic; it appeared during the æmia produced, and was cured by thymol.

[1] Abstracted from *Bull. de la Soc. Med. des Hôpitaux*, 1920.

STUDIES ON THE ACTION OF VARIOUS SALTS ON THE LIVER AFTER THEIR INTRODUCTION INTO THE DUODENUM.[1]

By Max Einhorn, M.D.

About four years ago Meltzer suggested the use of magnesium sulphate injections into the duodenum for the relief of biliary colic. Believing that the colic is caused by a spasm of Oddi's sphincter, Meltzer thought that this remedy, by its relaxing effect, would remove the pain.

Lyon employed magnesium sulphate instillations into the duodenum in order to relax the sphincter of Oddi, and at the same time produce (according to the physiological laws of contrary innervation) a contraction and emptying of the gall-bladder. He then promulgated this method of magnesium sulphate injection (75 c.c. of a 33 per cent. solution) into the duodenum for diagnostic purposes.

In collecting this fluid from the duodenum by

[1] Abstracted from the *New York Medical Journal*, vol. cxiii, No. 8, February 19, 1921.

siphonage for half an hour or more after the magnesium injection, Lyon believed he was able to obtain the bile separately from the common duct, the gall-bladder, and the liver. Lyon expresses himself as follows:—

"Before the magnesium sulphate has entirely run in, the tubing is connected to the bottle and gentle aspiration started, and the magnesium sulphate returns at first uncoloured, but within one to six minutes, normally, the sphincter is relaxed and the magnesium sulphate becomes tinged with bile, which becomes steadily deeper until pure bile alone is being recovered. When the first bile, which I will call A bile, and believe to be that contained in the common duct, plus a few drops from the cystic duct and a few mils perhaps of freshly secreted liver bile passing down the hepatic ducts, deepens to a distinctly deeper golden yellow or becomes in any way off colour and of heavier viscosity, this bottle is detached and drainage of this darker bile allowed to continue until the third transition to a much lighter yellow and thinner bile appears, when a final bottle is attached to continue the bile collection to the end of the drainage period.

"The darker bile appearing in the second transition I will call B bile, and believe it to be almost entirely from the gall-bladder, mixed, of course, with a few drops or mils of liver bile. The third type, of very light yellow limpid bile which appears in normal cases in the third transition, I will call C bile, and believe it to be bile recently elaborated by the liver cells and freshly secreted. I feel safe in saying that, if carefully done, the majority of A bile is common duct bile, that by far the majority of B bile is derived from the gall-bladder, and, if the latter has emptied completely, that practically all of C bile is freshly secreted liver bile."

In this way Lyon thought a refined diagnosis of the different sections of the biliary system could be established. His opinion was based on the observation that, after the instillation of the magnesium salt, the flow of the bile changes in character, first flowing light yellow, then dark brown, later on yellow again. The dark bile Lyon considered as coming directly from the gall-bladder, the dark being due to the stay of this fluid in the gall-bladder for a longer time and its concentration while there. Many clinicians and surgeons have used the magnesium sulphate test and corroborated Lyon's findings, taking for granted that Lyon's conclusions were correct.

If one follows the variations of colours of the duodenal contents after the introduction of magnesium sulphate, one will observe that the change from yellow to dark brown does not take place abruptly, but rather gradually. At first the contents appear light yellow and then show a deeper yellow, then brown, and ultimately a dark brown colour. This acme of the colour reactions lasts a few minutes (i.e., the flow continues in about the same shade), when a gradual reverse or diminution of the colour reaction takes place. The change of colour this time does not occur suddenly, but forms a gradual mutation of colours from dark brown to light brown, yellow, and golden yellow.

If these changes in colour were due to bile obtained from the different sources, the gall-bladder containing the darkest, as Lyon explains, the outpour of the gall-bladder bile would have as its effect a sudden change in colour from golden yellow to dark brown or almost black, and again, after the bladder has emptied itself, there would be a sudden return to the original yellow colour. This, however, is not the case. With few exceptions, when this colour play appears, the changes are gradual. This forces us to look for an explanation of these changes somewhere else, except in the emptying of the gall-bladder, probably in the action of the magnesium sulphate on the liver and its secretion, the bile. In order to investigate these points, a number of experiments were undertaken, which are recorded in their sequence.

Bile mixed with magnesium sulphate does not change its colour; the specific gravity, however, becomes higher. An approximately 5 per cent. solution of magnesium sulphate in bile gave a specific gravity of 1,055, while the same bile without the sulphate had a specific gravity of 1,013.

Bile mixed with sodium sulphate increases the specific gravity in a minor degree, a 5 per cent. solution of sodium sulphate in bile gave a specific gravity of 1,030, while the same bile before the addition of the sodium sulphate had a specific gravity of 1,012.

Sodium sulphate hardly changes the specific gravity. Bile with 5 per cent. sodium sulphate was 1,021, while originally it was 1,012.

The salts were given in different strengths in 60 c.c. doses to patients, injecting them into the duodenum of the same individuals in the fasting condition on different days.

It was in this way possible to make a comparative study of the action of various salts under similar conditions in the same individuals.

The changes regarding the specific gravity as described in bile mixtures with salts are found in the duodenal contents after the instillation of the respective salts (in concentrated form) into the duodenum. The colour changes are encountered after the instillation of concentrated magnesium sulphate and sodium sulphate solutions into the duodenum, indicating that the colour reaction is not due to the relaxing effect of the magnesium, for then sodium would fail to do it. It appears that the sulphate part of the salt (magnesium, sodium) is in part the instigator of the colour reaction, although there are other substances which do the same. It is probable that the sulphates, when excreted by the liver with the bile, undergo the changes in colour described.

Next to these substances the high concentration of the salts introduced may have something to do with the increased flow of bile and other juices.

The former causes a disturbance in the normal salt level of the blood and provokes a defensive action in the neighbouring organs to counterbalance the evils. Thus, the liver, pancreas, duodenum, and probably also the stomach, are brought to increased functional activities.

The view that the sulphates play a part is substantiated by the fact that sodium sulphate and bicarbonate of soda in the same concentration fail to produce the same play of colours as the sulphates.

Another proof of the truth of this theory is found in the fact that a repetition of the magnesium sulphate does, immediately after the effect of the first instillation has passed, bring on a repetition of the various colours of the duodenal contents in a manner similar to the first injection. This cannot be explained by an emptying of the gall-bladder, as this organ has not been given a chance to fill up after the first experiment.

Magnesium citrate, 10 to 13 per cent. solution instilled into the duodenum, has less effect upon the yellow colour of the bile, i.e., it does not grow darker, or it does so in a much less degree. This also shows that the dark colour obtained after magnesium sulphate is not due to the magnesium but to the sulphate; or, that the magnesium which should open and empty the gall-bladder is not its cause, but something else.

The amount of magnesium or sodium sulphate or its concentration in the fluid has likewise an influence on the degree of the colour changes of the returning bile and its specific gravity. In other words, the higher the percentage of the salts, the more intense the colour at its acme and the higher the specific gravity. This can be explained by the action of these salts on the liver, but not by an opening up of the gall-bladder, for then the gall-bladder would always appear in the same state and not in variations.

I have also tried to study the effect of magnesium sulphate upon patients whose gall-bladders have been removed. In some of them I could observe a similar colour play after the magnesium sulphate instillation.

Therapeutically the beneficial action of saline aperients on the liver is well established. By various studies the efficacy of the magnesium and sodium sulphates in liver disturbances becomes more clear. These salts seem to stimulate this organ. The aperient waters are ordinarily taken by mouth. Would they not manifest quicker and better action when instilled directly into the duodenum? This is another problem worthy of investigation.

MASSIVE INFECTION OF A VACCINATED PERSON WITH *BACILLUS TYPHOSUS*.[1]

By Brooks C. Grant, M D.

That typhoid vaccination produces a high degree of immunity is proved by Army statistics, and the fact is generally accepted to-day. However, no proof has been available that such vaccination could protect against massive infection.

This case of massive infection with *Bacillus typhosus* is reported on account of the rarity of such an occurrence.

Report of Case.

October 16, 1920, Private First Class F.L., a technician in the Laboratory, Eighth Corps Area, while working with a heavy suspension of living *Bacillus typhosus* (K110, Army Medical School strain) sucked a quantity of this culture suspension through the cotton plug of the pipette into his mouth, the quantity being approximately 0·5 c.c. He immediately reported the fact and washed his mouth thoroughly, three times, with 50 per cent. alcohol.

This soldier had had measles, whooping-cough, diphtheria and scarlet fever, but denies having had typhoid fever or any continued fever that might have been typhoid. He was last vaccinated with triple typhoid (saline) vaccine, August 16, 1919, or one year and two months prior to his infection. He was at once given 0·5 c.c. of triple typhoid vaccine in the hope of increasing his immunity.

October 21, four days after infection, the soldier complained of slight headache, but had a normal temperature. No further symptoms appeared until October 24, the eighth day after the infection, when he complained of slight headache and weakness. His temperature was normal. A blood culture was negative. This greatly relieved the soldier's anxiety, and he had no further symptoms of note.

October 28, a specimen of fæces was collected and plated on endo medium in the usual manner. The typhoid-like colonies appeared in a proportion of about 1:10 of *B. coli*. These were picked and proved to be *B. typhosus* by the customary sugar and serum reactions. This fact was not revealed to the soldier, and other symptoms did not appear. He was watched closely from this time on, and was allowed to continue working in the laboratory. His stools were repeatedly examined, and they have continued to be negative for typhoid since October 31.

Summary and Comment.

A person giving no history of ever having had typhoid fever, but having been vaccinated with triple typhoid vaccine, received a massive dosage of living *B. typhosus*. Four days later he had a headache and feeling of malaise, and on the eighth

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxvi, No. 8, February 19, 1921.

day headache and weakness. No further symptoms ever developed. On the twelfth day after infection *B. typhosus* was present in his stools, but by the fifteenth day they had disappeared, and have not been found since that time.

This case is interesting, since it demonstrates that, in certain cases at least, typhoid vaccination will protect even against massive infection. The dose was enormous, and must have been many thousand times the usual infecting dose. That the man was actually infected was proved by the recovery of the typhoid bacillus from his stools. But it could not be found in his blood, and at no time did he have fever. He has remained well for seventy-five days. No similar case is known to be on record.

Current Literature.

Indian Medical Gazette.

Vol. LVII, No. 5, May, 1922.

The Rôle of Vitamines in Tropical Diseases (J. A. Shorton).—The author discusses the effect of general vitaminic deficiency in interfering with digestion, absorption and utilization of foodstuffs, thereby producing a state of malnutrition and lowering the resistance to infection; and the specific effect of the absence of certain classes of vitamines, causing the so-called deficiency diseases, such as pellagra, beriberi, &c.

Yaws in Malaya: its Treatment and Prophylaxis (A. Viswalingam).—The author is of the opinion that novarsenobillon is the best treatment for yaws, both for effecting a rapid cure and arresting the disease. Yaws is a disease where the maximum sterilizing therapeutic results of novarseuobillon can be obtained. Two or three injections of the drug are all that are needed to attain the desired effect. In cases of secondary lesions of bones, joints, &c., the exhibition, in addition, of pot. iodidi with antimon. tartaratum gives the best results. In cases with extensive necrosis of the bones or pseudo-mycetoma, surgical measures, amputation, excisions, &c., are indicated. The following measures are suggested to prevent the spread of the disease:—

All persons suffering from active yaws should be treated with novarsenobillon.

A census of all persons suffering from yaws should be taken.

All such individuals should be required to attend at various hospitals and dispensaries for treatment.

On these occasions, and also in schools, mosques, and other public places, lectures should be given explaining how yaws spreads and how it can be prevented.

The Differential Blood Count (L. E. Napier).—If differential blood counts are to be of any value to the clinician more consideration must be given to the method by which they have been done.

The most uniform results are obtained by making a very small film and counting every leucocyte on that film. Whatever method is adopted not less than 400 leucocytes should be counted.

Bulletin de la Societe de Pathologie Exotique.

Vol. XIV, No. 7.

Dermato-mycosis in French Guiana (W. Dufougère).—In addition to the known types of frambœtic dermatosis due to *Leishmania tropica* Wright and *Spirocheta pertenuis* Castellani respectively, there would seem to be a third type, caused by a fungus, a cryptococcus-like parasite having been isolated both from verrucous and gummatous ulcers. Studied among the convicts of the French penal settlement, the ætiology of the infection could not be proved, but its frequency among prisoners engaged in tree-cutting suggests that inoculation occurs through the medium of splinters. Cure may be effected by giving large doses of potassium iodide (6 to 8 grm. per day), the most obstinate ulcers rapidly disappearing under this treatment. Neither visceral manifestations nor fatal generalizations of this mycosis have so far been seen.

Another Mycetoma of the Foot, of the Madura Foot Type and due to Nocardia Maduræ, observed in Algeria (J. Montpelier and A. Lacroix).—This case brings the number of madura feet observed in Algeria to six, and the number of varieties to four. Sections of grains showed the zone of undetermined substance around a closely tangled mass of fine microsiphons which is characteristic of *Nocardia maduræ*, and this diagnosis was confirmed in culture by the very small and compact grains which were first of a whitish colour, and later on became reddish.

Discovery of Large Numbers of Trypanosoma gambiense in Hydrocele Fluid (J. Arlo).—Fluid from the tunica vaginalis of two old men suffering both from trypanosomiasis and hydrocele was found on direct microscopic examination to contain large quantities of *Trypanosoma gambiense* in every field. Never having seen so many trypanosomes in the blood, out of thousands of patients examined, the author is led to suppose that hydrocele fluid, which is very similar to blood serum in chemical composition but relatively poor in white cells, is a favourable medium for the growth of *T. gambiense*. In one of the cases the operation of drawing off the fluid was interrupted before completion, and when resumed next day the remaining fluid contained scarcely any flagellates; this was due, presumably, to a very small amount of blood serum having entered the tunica vaginalis in consequence of the slight trauma attendant upon the puncture.

Original Communications.

SEROLOGICAL RESEARCHES ON PROTOZOA

(1) Morphology and Serological Properties of Prowazekia (Bodo) edax.

By Ludwik Anigstein, M.D., Ph.D.

From the State Epidemiological Institute, Warsaw (Director, Dr. J. Rajchman).

The serological methods which have been such a help to diagnosis in bacteriology have not as yet been applied in the domain of protozoology. The only diagnostic method—complement-fixation—applied in syphilis is based as generally known, not on presence of spirochætes in the antigen, but on the existence of lipoid substances in normal organs. In the course of diseases caused by protozoa, these form in the organism antibodies, owing to which the parasites in a certain moment disappear from the blood (relapsing fever, trypanosomiasis). The specificity of these antibodies reaches very far. The characteristic of the protozoa is the creation of strains, resistant against antibodies in the course of infection—for instance, in relapsing fever—where appear races of spirochætes with specific serological properties. The serological diagnosis in diseases caused by protozoa must take into consideration the fact that antibodies in different phases of disease will be directed against serologically different races of microorganisms.

The serological methods applied in practical protozoology would be of great value, especially in those diseases, the course of which is a latent infection (malaria, trypanosomiasis), or if examination requires a special experience of the protozoologist (amœbic dysentery). A sufficient quantity of protozoa as antigen is an indispensable condition of the serological methods, and that is connected with technical difficulties, because we are not able to cultivate the majority of pathogenic protozoa *in vitro*. Sometimes parasites live in fairly large quantities in the organism of the patient (trypanosomes, spirochætes), but very often the number of pathogenic protozoa in the animal organism is very small.

The phenomenon of agglutination, similar to that of bacteria, has been observed with trypanosomes. The specific agglutination of *Trypanosoma lewisii* appears, according to Laveran and Mésnil, after a few minutes in the specific serum dilution 1 :10,000, while the normal serum agglutinate trypanosomes in the solution 1 :50 at the outmost.

The agglutination of trypanosomes differs from the agglutination of bacteria by an important property—namely, that the trypanosomes do not lose under the influence of immune-serum their motility, and what is very important, their agglomeration disappears after a certain time, owing to active movements. An analogical phenomenon has been observed with pathogenic spirochætes (*Spirillum gallinarum*). In contrast to bacteria, the killed spirochætes do not agglutinate under the influence of specific sera. Non-parasitic protozoa, artificially introduced into an animal organism, equally create antibodies. The first experiments on this were made by Roessle (1905). The author injected into rabbits and guinea-pigs cultures of *Paramœcium caudatum*. Antibodies formed in this way paralysed and killed the above-named protozoa, but did not dissolve them. Roessle observed that under the influence of specific sera different protozoa adhered to the test-tubes. The influence of serum on *P. caudatum* was specific, it immobilized exclusilvely this species, while other species of paramœcium did not give any reaction.

Coca (1912) was the first to apply serological methods to amœba. This author has used two strains of amœba, cultivated on agar plates, together with a certain bacteria. The immune sera agglutinated homological strains of amœba, and in a slighter degree heterological strains of the same.

Further researches on amœba were undertaken by Schuckmann (1920), who obtained sera possessing agglutinins and complement-fixating antibodies. These sera agglutinated exclusively homological amœba strains, and that rendered possible the identification of amœbæ of different origin which till then was possible only by means of cytological studies. The amœbæ became globular, lost their motility and formed clumps. After a certain time the amœbæ regained their normal amœbic form and movements. This temperorary agglutination reminds of similar agglomeration phenomena with trypanosomes.

The examination of phenomena among protozoa under the influence of specific antibodies is the object of the present work. Studies begun with non-parasitic flagellates, artificially introduced into animal organisms, will be followed by serological researches on pathogenic protozoa.

Origin and Systematic Position of the Examined Flagellate.

I have carried out my researches with a flagellate, which appeared in great quantities, together with other protozoa, in a tube containing putrefying organic matter.

On the close examination of the morphology of this flagellate, it appeared that it was one of the representatives of the Bodoninæ group (Bütschli), similar, and even, according to different protozoologists, identical with prowazekia (Hartmann and Chagas). According to Hartmann, prowazekia, together with trypanosomes, piroplasma and halteridia, forms the parasitic group "Binucleata."

Some of the species of Prowazekia lead a non-parasitic life, while the majority of them live in the human intestine. Both groups possess a blepharoplast at the basis of the two flagella. These flagellates have been often found in the human intestine and considered to be Bodo. The term

prowazekia was introduced by Hartmann and Chagas (1910) for a parasite of the human intestine. Castellani and Chalmers have given a description of a similar parasite, calling it *Bodo asiaticus;* Whitmore changed this name into *Prowazekia asiatica.*

The morphological feature of Prowazekia (Bodo) and their way of life suggests that the free living prowazekia (bodo) may, under special circumstances, become parasitic. Recently Wight and Lucke (1920) discovered in the blood of three men deceased from acute influenza a flagellate with two flagella and a blepharoplast. It was found in the blood from the heart, in the lungs, sinus sphenoidalis; the authors succeeded in obtaining a culture on agar with glycerine and rabbit blood. Wight and Lucke define it as a prowazekia, do not consider it pathogenic, and believe its occurrence in these cases to be an accidental one.

In the group " Binucleata " prowazekia stand the nearest to trypanoplasma, with which they are connected in the same way as trypanosoma to herpetomonas. The flagellate described by Kühn (1915) is the best studied of the genus bodo (prowazekia); the author identifies it with the well-known *Bodo edax* (Klebs). Kühn agrees with the point of view that bodo and prowazekia are identical, but he maintains for the described flagellate the term *Bodo edax.*

Agreeing with the point of view that identifies prowazekia and bodo, and considering that the flagellate I am going to describe is the same as the *Bodo edax* of Kühn, I will apply to the flagellate of the present research the name *Prowazekia (Bodo) edax.*

Morphology.

(In collaboration with Assistant-Professor Dr. H. Raabe.)

The movement of prowazekia is complicated; it is generally vibrio-like, and consists of a progressive movement, combined with rotation. The body in form of a pear possesses on its broader anterior side two flagella which, when the flagellate is alive, can easily be observed under a dark-ground illumination. One of the flagella is shorter; its length exceeds a little the size of the body; it is directed to the front, while the other one, considerably longer, is directed to the back. In the anterior part of the living flagellate we can see a globular corpuscle—blepharoplast—situated at the basis of the flagella.

In vital staining by neutral red (1 : 1,000 in 0·6 per cent. saline), the blepharoplast comes forth uniformly and intensively pink; besides, we observe a vesicular nucleus, the karyosome of which takes only a slight red tinge, while the surrounding substance does not take the colour. The protoplasma granulations take an intense yellow colouring, and the basic refractile corpuscles of the flagella are stained pink. For permanent preparations the living flagellates were fixed in hot Schaudinn liquid and stained with Wright-stain during several hours, after which they were differentiated in aceton-alcool.

The nucleus-karyosoma takes a reddish colour, the surrounding substance a bluish one, while the blepharoplast takes an intensive and uniform dark purple colour. The flagella are stained purple. In the protoplasma we see vacuoles, almost always one of them in the anterior part of the body, and a few smaller ones in the posterior part of the flagellate.

The length of the parasite is of 8 to 12 microns and the width 5 to 7 microns.

Cultures.

Prowazekia edax may be comparatively easily cultivated *in vitro;* the rapidity of its multiplication is very considerable. For the purpose of the present study I was obliged to obtain a genetically pure strain. I have applied the principle of so-called mixed pure culture (Mouton), which is based on the symbiosis of the isolated strain of protozoon with a definite type of bacteria. Oehler (1917) has cultivated different strains of amœba with bacteria alive and killed, and he insists on the fact that such cultures are composed of two media—namely, of agar as medium for bacteria and of bacteria as nutrition for protozoa. I have obtained from the original culture in which lived considerable numbers of prowazekia a growth of water-bacteria on ordinary agar. An emulsion of these bacteria was prepared as nutrition for the flagellates. I obtained the first cultures of prowazekia in tubes containing 1 per cent. English peptone water with an addition of one drop of bacterial emulsion. The growth of the bacteria during twenty-four hours at a temperature of 28° C. was sufficient to afford nutrition for flagellates added on the following day. The tubes remaining at a temperature of 15° C. for three to four days contained a considerable quantity of flagellates, found especially on the surface; one loop contained thousands of them. 5 per cent. broth is also a convenient culture medium. Besides, I have also cultivated the flagellates on 1 per cent. aqueous slant agar, where they agglomerated not only in the condensing water, but crept on the agar surface, probably by means of flagella, forming a greyish pellicle. For the present work it was indispensable to (1) cultivate flagellates on a single type of bacteria, (2) to obtain a genetically pure flagellates strain. In order to have a very large amount of flagellates I have used 1 per cent. agar plates, which I covered with a thin layer of 1 per cent. peptone water or 5 per cent. broth. One drop of bacterial emulsion was added to each plate, and they remained for twenty-four hours in an incubator (28° C.), after which one loopful of flagellates was added.

After three to four days the number of flagellates contained in 1 mm.^{3} was of tens of thousands. From a drop containing a few flagellates, one of

them was isolated by means of a capillary tube and placed in a culture tube with the above-mentioned medium and bacteria. After a few days one specimen gave a great quantity of flagellates. The pure strain obtained in this way has been cultivated since one year and designated as strain F.

After having obtained a pure strain of prowazekia it was necessary to bring the culture up to the "mixed pure culture," feeding the flagellates with a single type of bacteria. For this purpose I began to cultivate the strain F. with the following bacteria: *Bacillus proteus* X 19, *B. prodigiosus, B. coli, Staphylococcus albus, Sarcina lutea.* Only after a long series of inoculations from plates on fresh media, containing a pure culture of the special bacterium, it was possible to obtain a "mixed pure culture." The plates contaminated with foreign bacteria were discarded.

The cultures of flagellates multiplied most quickly and abundantly with *B. prodigiosus* and *staphylococcus albus.* Probably bacteria of larger size are not of much use as nutrition for flagellates, for instance, cultures of flagellates with *Sarcina lutea* hardly developed, because these bacteria were not very much smaller than the flagellates. On the contrary, *Staphylococcus albus* proved to be an excellent medium, and the flagellates cultures on these bacteria were the most abundant. *Prowazekia edax* behaves differently than amœbæ with regard to the selection of bacteria for nutrition; the amœbæ devour more easily Gram-negative bacteria than Gram-positive ones (Oehler, 1916).

Experiments on Immunization.

The first rabbit was immunized by repeated inoculations into a vein of a gradually increasing quantity of prowazekia plus *B. coli* culture. The first time I inoculated 0·25 c.c. of the culture, afterwards every six days 0·5 c.c. The rabbit No. 2 was inoculated with the culture of prowazekia plus *B. prodigiosus.* The number of flagellates in emulsion was determined by means of a Thoma-Zeiss apparatus. Before putting on the cover-glass the flagellates were killed by osmic acid vapours. The number of flagellates in 1 mm.^{3} of emulsion was of 16,000, therefore in 0·5 c.c. inoculated to the rabbit they were about eight millions. After seven days the same rabbit was inoculated with 1 c.c. of forty-eight hours' old flagellates culture plus *B. prodigiosus.* The emulsion was very thick. The number of flagellates was of 28,000 in 1 mm.^{3}, i.e., 28 millions in 1 c.c. The third dose inoculated to the rabbit No. 2 after five days was of 1·5 c.c. emulsion, and contained also 28,000 in 1 mm.^{3}, in total 42 millions. In this way the rabbit received 86 million flagellates.

The rabbit No. 3 after immunization with prowazekia plus *B. proteus* X 19, died on the third day after the first inoculation.

I employed, besides the rabbits, also frogs (*Rana esculenta*) for my experiments on immunization. I obtained a specific serum from one of these. This frog weighed 57 grm., and was inoculated three times with a culture of prowazekia plus *Staphylococcus albus* into the lymphatic cavities. The first dose was 0·4 c.c.; the second, after five days, 0·8 c.c.; and the third, after eight days, 1 c.c. of prowazekia culture.

Phenomena of Immunity.

Lysins.

The dissolving of protozoa under the influence of specific antibodies has been described so far only for the parasitic protozoa. Leger and Ringenbach have proved the presence of trypanolytic bodies in the serum of animals affected with trypanosomiasis; when the authors mixed this serum with trypanosomes, these were dissolved in a very short time. The researches of Rodet and Vallet, as much as those of Levaditi and Mutermilch, proved that under the influence of the immune serum trypanosomes are immobilized, and after follows their dissolution (Laveran and Mésnil, 1912, 146). I have mentioned before the observation of Manteufel (1907) regarding the lysis of the *Spirochæta obermeieri* under the influence of sera of animals recovered from relapsing fever. Takenouchi (1918) observed cytolysis, under the influence of immune serum of *Paramœcium caudatum.* The researches of Takenouchi (1918) and Schuckmann (1920) confirmed that specific serum does not dissolve amœbæ, who only lose their movements, and become globular, forming cysts.

My own researches, to find lytic antibodies in the immune serum against prowazekia, had a negative result. For this aim I carried out three series of experiments. For the first series I have used active specific serum against these flagellates with *B. prodigiosus.* I have added to each tube, containing one to three drops of this serum, three drops of thick emulsion of flagellates cultivated on *B. prodigiosus.* Similar tests were made with inactivated immune-serum, and reactivated by the addition of one drop of guinea-pig complement. The specimens were examined after five minutes, and afterwards, during two hours, every fifteen minutes. After five minutes the movements of almost all the flagellates were stopped; some of them were agglutinated in clumps. The control test by means of normal rabbit serum and immune serum against an infusorium (*Colpoda*) caused for some time a weakening of the flagellates' movements, but these were resumed after a short time.

Other experiments were made with the culture of prowazekia plus *B. proteus* X 19. The use of heterological bacteria (proteus) did not modify the course of the reaction. Cytolysis did not appear.

Agglutination.

It is noted that the first stadium of agglutination of motile bacteria is the paralysis of separate in-

dividuals. The bacteria do not die; they can even multiply in clumps formed by agglutination. Moreover, the viability of the bacteria is not an indispensable condition for agglutination, because, as well known, the agglutination takes place also with killed bacteria.

The agglutination of protozoa differs from this phenomenon with motile bacteria. Laveran and Mésnil (1912, 228), in their description of *Trypanosoma lewisii* agglutination, insist on the fact that the organisms clumped together separate again after some time under the influence of active centrifugal movements of the trypanosomes. The same phenomenon was also observed with pathogenic spirochætes. Amœbæ clumped together under the influence of specific sera separate in one to one and a half hours, while those killed by chloroform remain agglutinated (Schuckmann, 1920).

For the agglutination test in my experiments I have used the specific immune serum from the rabbit No. 2. A series of drops of different serum dilutions (1:60—1:1,600) in 0·6 per cent. saline were put on slides; to each drop I have added some thick emulsion of living prowazekia, and examined the whole under the microscope.

For my first tests I have used the strain of prowazekia and homological bacteria, i.e., those used for immunization.

REPORT No. 1.

Agglutination of Prowazekia edax.

Time	Active immune serum						Normal serum	Colpoda serum	0·6 per cent. NaCl.
	1:50	1:100	1:200	1:400	1:800	1:1600	1:50	1:50	
1 min.	+	+	±	−	−	−	−	−	−
5 ,,	+++	++	+	+	±	−	−	−	−
30 ,,	+++	+++	++	++	++	±	−	−	−
1 hr.	+++	+++	+++	+++	++	+	−	−	−
2 ,,	+++	+++	+++	+++	++	+	−	−	−
4 ,,	+++	+++	+++	+++	++	+	−	−	−

It may be seen from the above table that the agglutination of flagellates appears already during the first minute of their contact with the specific serum. Under the magnification, about 150 times, it may be seen after one minute in the microscope field from place to place agglutinating pairs of flagellates (plus), which are joined beside swimming specimens, forming clumps (plus, plus). The number of clumps increases in the same time their size grows, because they include a few scores, and sometimes a few hundred of specimens.

In the serum dilution of 1:1,600 a weak agglutination appears only after thirty minutes. During the whole course of agglutination the flagellates are in a state of active movement, so that the clumps are swimming about. The formed agglomerations do not dissolve as do agglutinated trypanosomes or amœbæ, but increase in size because of glueing to them of other flagellates. The described clumps after twenty-four hours' stay in a drop of diluted specific serum do not dissolve, but even multiply considerably.

The study of the mechanism of agglutination was facilitated in a great measure by the use of dark-ground illumination. The swimming flagellates grapple each other with the flagella, winding them together, at the same time showing violent movements as if trying to release themselves. The same mechanism of agglutination may be observed also in preparations fixed in Schaudinn solution and stained by Wright method. In such preparations the agglutinated flagellates are united by the flagella.

In each series of experiments the normal rabbit serum and the serum obtained by immunization of a rabbit with a culture of *Colpoda* were used for control test. As can be seen from Reports Nos. 2 and 3, these controls were always negative, as well as those with saline solution.

REPORT No. 2.

Agglutination test with the antigen prowazekia + proteus X 19.

Time	Inactivated immune serum						Normal serum	Colpoda serum	0·6 per cent. NaCl.
	1:50	1:100	1:200	1:400	1:800	1:1600	1:50	1:50	
1 min.	+	+	±	−	−	−	−	−	−
5 ,,	+++	+++	+	+	±	−	−	−	−
30 ,,	+++	+++	++	++	+	+	−	−	−
1 hr.	+++	+++	+++	++	++	+	−	−	−
2 ,,	+++	+++	+++	+++	++	+	−	−	−
Monas	−	−	−	−	−	−	−	−	−
Colpoda	−	−	−	−	−	−	−	+	−

Further experiments were made with immune serum against prowazekia on other protozoa, namely, with a culture of Monas sp. and colpoda. These protozoa did not react with the prowazekia serum, the colpoda agglutinated with the specific colpoda immune-serum. The agglutination test with emulsion of killed prowazekia gave a negative result. The flagellates were killed by vapours of chloroform, osmic acid, formol or phenol; also by a temperature of 40°-50° C.

As well known, other protozoa (trypanosomes, amœbæ) can be agglutinated as well after killing. Laveran and Mésnil (1912).

I have mentioned before that beside the rabbits I have used also frogs for immunization. From one of them I obtained a specific serum which agglutinated prowazekia, but only up to the dilution of 1:500 after one hour.

In serological tests on protozoa we must consider the auto-agglutination which appears in the cultures of some protozoa, for instance, *Colpodium colp.* Schuckmann (1920) mentions an auto-agglutination

of amœba strains on agar plates. In *Prowazekia edax* cultures I have never observed this phenomenon of pseudo-agglutination; sometimes they gathered around a corpuscle or a group of bacteria, but this could be easily differentiated always from agglutination.

The Complement-fixation.

This method, using protozoa as antigen, was applied by Levaditi and Mutermilch (1909) to the diagnosis of trypanosomiasis. Schuckmann (1920) has proved the presence of antibodies for amœbæ, as well as for bacteria used as nutrition for the amœba.

I have used as antigen for my first experiments of complement-fixation *Prowazekia edax* plus proteus X 19, or staphylococci. In this way was eliminated the eventual action of antibodies (inhibition of homolysis), directed in serum No. 2 against *B. prodigiosus*, because the bacterial part of the antigen was heterologous. Each series of experiments was preceded by the standardizing of the antigen itself for the determination of its minimal dose, which does not inhibit the hæmolysis. As example, I quote the Report No. 3.

Report No. 3.

The Standardization of Antigen.

In the tubes 1-4 the antigen consists of prowazekia and staphylococcus.

In the tubes 6-9 the antigen consists of staphylococcus.

No. of the tubes	Antigen	Complement	5 per cent. blood corpuscles sensibilized.	Hæmolysis after 18 hours
1	0·2	0·1	1·0	–
2	0·15	0·1	1·0	–
3	0·1	0·1	1·0	±
4	0 05	0·1	1 0	+ +
5	—	0·1	1·0	+ + +
6	0·2	0·1	1·0	–
7	0·15	0·1	1·0	+
8	0·1	0·1	1·0	+ +
9	0·05	0·1	1·0	+ + +
10	—	0·1	1·0	+ + +

These tests prove that 0·1 of flagellate emulsion provokes itself already a slight inhibition of hæmolysis, while 0·05 of antigen is a dose available for reaction. The emulsion of bacteria gives a much weaker hæmolysis—in a dose of 0·2 c.c. only.

For the definite reaction we used specific serum in dilution of 1:50—1:400 in quantities of 0·5 c.c., in each tube adding 0·1 of complement, 0·05 of antigen, and 0·1 of bacteria.

This mixture remained during one hour in an incubator of 37° C., after which we added 1 c.c. of hæmolytic system, and placed it in a water-bath (37° C.) for fifteen minutes. The result of the reaction was read after eighteen hours.

Report No. 4.

Complement fixation with the immune serum against prowazekia + *B. prodigiosus*, with the antigen *Prowazekia staphylococcus* (1-12), and the antigen staphylococcus (13-21).

Total inhibition of hæmolysis is designated as –, weak inhibition +, partial hæmolysis + +, total hæmolysis + + +.

No. of the tubes	Immune serum		Complement	Antigen	5 per cent blood corpuscles sensibilized	Hæmolysis after 18 hours
1	1:50	0·5	0·1	0 05	1·0	—
2	1:100	0·5	0·1	0·05	1·0	—
3	1:200	0·5	0·1	0·05	1·0	+
4	1:400	0·5	0·1	0·05	1·0	+ +
5	—	—	0·1	0·05	1·0	+ + +
6	1:50	0·5	0·1	—	1 0	+ + +
7	1:100	0·5	0·1	—	1·0	+ + +
	Normal serum					
8	1:50	0·5	0·1	0 05	1·0	+ +
9	1:100	0·5	0·1	0·05	1·0	+ + +
10	1:200	0·5	0·1	0·05	1·0	+ + +
11	—	—	0·1	0·05	1·0	+ + +
12	1:50	0·5	0·1	–	1·0	+ + +
	Immune serum			*Staph. albus*		
13	1:50	0·5	0·1	0·1	1·0	+ +
14	1:100	0·5	0·1	0·1	1·0	+ + +
15	1:200	0·5	0·1	0·1	1·0	+ + +
16	1:400	0·5	0·1	0·1	1·0	+ + +
17	—	—	0·1	0·1	1·0	+ + +
18	1:50	0·5	0·1	—	1·0	+ + +
19	1:100	0·5	0·1	–	1·0	+ + +
	Normal serum			*Staph. albus*		
20	1:50	0·5	0·1	0·1	1·0	+ + +
21	1:100	0·5	0·1	0·1	1·0	+ + +

The total inhibition of hæmolysis was observed in the first two tubes. All control tests (with normal serum and bacterial antigen) gave a negative result, with exception of tubes Nos. 8 and 13, in which we found a slight inhibition of hæmolysis.

These results indicate the existence in the immune serum of antibodies, fixating the complement in the presence of *Prowazekia edax*. At the same time we may observe that this serum does not contain antibodies against the non-specific bacterial part of antigen, namely, against staphylococcus, notwithstanding the fact that they are employed in a double dose. For the purpose of finding in the immune-serum antibodies directed against bacteria which served as nutrition for flagellates and were injected into the rabbit, I have made a series of experiments with strictly homologous antigen, i.e., with *Prowazekia edax* plus *B. prodigiosus*. The result of these experiments can be seen in the Report No. 5.

REPORT No. 5.

Complement fixation with the immune serum against prowazekia + *B. prodigiosus* and the antigen prowazekia + *B. prodigiosus*.

No. of the tubes	Immune serum		Complement	Antigen	5 per cent. blood corpuscles sensibilized	Hæmolysis after 18 hours
1	1:50	0·5	0·1	0·05	1·0	—
2	1:100	0·5	0·1	0·05	1·0	—
3	1:200	0·5	0·1	0·05	1·0	—
4	1:400	0·5	0·1	0·05	1·0	+
5	—	—	0·1	0·05	1·0	+++
6	1:50	0·5	0·1	—	1·0	+++
7	1:100	0·5	0·1	—	1·0	+++
	Normal serum					
8	1:50	0·5	0·1	0·05	1·0	++
9	1:100	0·5	0·1	0·05	1·0	+++
10	1:200	0·5	0·1	0·05	1·0	+++
11	—	—	0·1	0·05	1·0	+++
12	1:50	0·5	0·1	—	1·0	+++
	Immune serum			*B. prodigiosus*		
13	1:50	0·5	0·1	0·05	1·0	—
14	1:100	0·5	0·1	0·05	1·0	—
15	1:200	0·5	0·1	0·05	1·0	±
16	1:400	0·5	0·1	0·05	1·0	++
17	—	—	0·1	0·05	1·0	+++
18	1:50	0·5	0·1	—	1·0	+++
19	1:100	0·5	0·1	—	1·0	+++
	Normal serum			*B. prodigiosus*		
20	1:50	0·5	0·1	0·05	1·0	+++
21	1:100	0·5	0·1	0·05	1·0	+++

We see that the complement-fixation reaction is specific for prowazekia in presence of immune-serum. The inhibition of hæmolysis appears equally in the series, where *B. prodigiosus* only serves as antigen; it indicates that the immune-serum contains also complement-fixating antibodies directed against the bacteria with which the flagellates were cultivated. The inhibition of hæmolysis in tubes containing double antigen (prowazekia plus prodigiosus) is stronger than in tubes containing bacterial antigen only.

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INTOLERANCE OF QUININE. A CASE REPORT.

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IN countries where malaria is endemic the widespread administration of quinine brings to notice occasional individuals who cannot tolerate the drug in doses large enough to be effective. Such drug intolerance is a serious matter in persons exposed to virulent malarial infections, because substitutes for quinine are usually less effective. In the case reported the intolerance shown was of a most marked degree, resulting in exfoliation of the skin in rather an unusual region. An attempt was made to overcome the intolerance by beginning with very small doses of quinine and gradually increasing the dosage, but the immunity thus secured was only partial and very transient. On account of the unusual nature of the reaction shown it is thought that this case warrants a somewhat detailed report.

CASE REPORT.

The patient was a Chinese male, aged 25 years, who was born in Hainan. He had an attack of fever (presumably malarial) about a year after he arrived in Bangkok. He accompanied the writer to Chiengmai, where he was engaged as a cook, and lived on the compound.

First Attack of Malaria (under observation).

A month after his arrival in Chiengmai, after a few days of malaise, he had a chill, followed by fever. Blood examination showed the presence of malarial rings of the benign tertian type. He was given a purge, followed by quinine bisulphate, 5 gr. every four hours, and received 30 gr. during the first twenty-four hours. Within a few hours after the administration of the first dose he complained of tingling and burning sensations in his hands and feet and generalized pruritus. On examination the extremities were found to be red and slightly swollen. The next day there was no fever, but quinine was continued in the same dosage. Small blisters had formed between the fingers and toes and the patient opened these. A slightly purpuric area was found on the right forearm and two others on the two thighs, the largest area being approximately 2·5 cm. in diameter. On the third day he had another chill, followed by a

rise in temperature to 104° F. Benign tertian rings and gametes were found in the blood. It was therefore thought best to continue the quinine in spite of the reaction. The temperature reached 102° F. on the fifth day. 20 gr. of quinine were administered during that day.

The next day the patient overcame his natural reluctance and called attention to the condition of his scrotum. It was found that almost the entire superficial layers of scrotal skin had come off, leaving an angry, purulent, denuded surface. He said that the skin of the scrotal region had been covered on the second day with small blebs similar to those on his fingers and toes. On account of the intense itching he had scratched the tops off of some of the blebs and the skin had peeled off in short strips. Careful examination revealed no local cause for this. Quinine was stopped after the fifth day and no chills or fever recurred. The scrotum was dressed daily and healed slowly.

Second Attack of Malaria (under observation).

A second attack of malaria occurred some weeks later, but the patient refused to take treatment until after several days of chills and fever. Blood examination showed large numbers of benign tertian gametes with many young ring forms. In the hope that he might tolerate quinine in another form, he was given a purge, followed by quinine hydrochloride, administered in doses of 2½ gr. every two hours for fifteen doses. Within a few hours after the initial dose of quinine he complained of tingling and burning sensations similar to those experienced on the previous attack. The hands and feet were slightly swollen and quite red. By the succeeding day small watery blebs had appeared on the fingers and toes. On the scrotum, which was examined daily, the skin was found to be covered with very minute watery blisters. He complained of the parts itching severely, but was cautioned against scratching the scrotum, and applications of 2 per cent. ammoniated mercury ointment with protective dressings were made. Quinine administration was stopped. The scrotal skin peeled off as on the former attack and to almost the same extent. Healing took place slowly. He was given Fowler's solution of arsenic in gradually increasing doses. The attacks of fever ceased after four days, and when examined a month later the gametes had disappeared from the blood.

Attempt to Overcome the Intolerance.

On account of the prevalence of malaria in the community, an attempt was made to overcome his intolerance of quinine. It was naturally difficult to secure his consent, but he finally consented. He was kept on Fowler's solution of arsenic. 1 gr. of quinine bisulphate in twenty-four hours was administered in divided doses for the first week, when the amount was increased to 2 gr. in twenty-four hours. The amount of quinine was gradually increased at intervals of seven days, careful watch being kept for any signs of intolerance. The patient was thus brought up to taking 10 gr. of quinine bisulphate daily without experiencing any difficulty. After a break of a month in treatment, he took a total of 10 gr. of quinine bisulphate daily for two days without inconvenience. During this period, in spite of the provalence of malaria, he remained free from malarial attacks, and the blood was free of detectable malarial organisms. He refused to continue the treatment as he considered himself to be well.

Third Attack of Malaria (under observation).

After an interval of two months, during which he received no treatment, he had a third attack of malaria. This attack occurred during a stay in the hills, and blood examination could not be made. With the hope that his tolerance persisted, he was given two compound cathartic pills, followed by a total of 10 gr. of quinine bisulphate. The next day the hands and feet were somewhat swollen and very red and itchy. The same was true of the scrotal skin. He was cautioned against scratching the scrotum. No further quinine was administered. The following day large blebs were found on the fingers of both hands. Each toe was covered from base to tip with a large watery bleb. Several purpuric areas appeared on the arms and thighs as in the previous attacks. The scrotal skin was almost wholly black and had begun to peel off, leaving an angry, moist, denuded surface covered with a sero-purulent discharge. The exfoliation continued until approximately two-thirds of the scrotal skin was affected. The parts were dressed daily and healed gradually.

During this attack the patient stated that he had been treated with quinine during his attack of fever in Bangkok, and had suffered from a similar exfoliation of the skin of the scrotum, fingers and toes.

The patient subsequently suffered repeatedly from attacks of malarial fever, which were with difficulty controlled by the use of other drugs.

Comment.

The interesting features of this case are:—

(1) *The Definiteness of the Intolerance.*

There is no question as to the causative agent of the reactions. The administration of quinine on each of four occasions (three of which were under observation) was followed by identical reactions with a promptness that leaves no doubt as to the toxic effect of the drug. The only other medicaments used (Fowler's solution of arsenic and purges of castor oil, magnesium sulphate, and compound cathartic pills) have been given to him repeatedly without any such effects. Careful examination of the genitalia on each occasion and during intervals between attacks ruled out any

local cause for the effects described. Quinine was the causative agent.

(2) *The Partial Overcoming of the Intolerance by gradually Increasing Doses of Quinine.*

By this means the patient was enabled to take 10 gr. of quinine daily, a dosage which was sufficient on a later occasion to cause severe symptoms.

(3) *The Transient Nature of the Acquired Tolerance.*

The acquired tolerance lasted for at least one month, but failed to protect him after a two months' interval.

(4) *The Selective Toxic Action of the Drug.*

The exfoliated lesions were limited on each occasion to the scrotum, fingers and toes. The small purpuric areas in other regions did not become exfoliated.

NOTE.—The observations upon which this paper is based were made with the support and under the auspices of The International Health Board of the Rockefeller Foundation.

A Note on the Treatment of Vomiting in Malaria (E. Lomax Wood, *Practitioner*, vol. cvii, December, 1921).—Six cases of acute malarial fever were treated with 7-8 minims of liq. adrenalin hydrochlor. in water. Invariably one single dose was sufficient to stop the vomiting. In two controls, in which this drug was not administered, the vomiting lasted for twenty-four hours.

On the Existence of Different Races of Entamœba histolytica (Rodenhuis, *Geneesk. Tijdschr. v. Neder.-Indie*).—The conclusion was come to by Dobell and Jepps that at least five races of *Entamœba histolytica* exist, which can be distinguished by the curves representing the dimensions of their cysts.

Irregularity of obliquity of the curves may be caused by:—

(1) Faulty technique in measuring the cysts.

(2) Encystation may take place at different stages of growth, and so produce cysts of different measurements.

(3) Surroundings may influence the conditions of life of the amœbæ. It is not certain that an amœbic strain is changed in dimensions by transmission from a carrier to another person.

Simultaneous occurrence of different races in one patient was never proved by the curves found. Any combinations which Dobell and Jepps cite concern a "small strain" besides an "ordinary strain," and it is argued that "small strains" can be attributed to different species, *E. tenuis*, which is without pathogenic action in young cats. The conclusion arrived at is that "the existence of different races within the species *E. histolytica* has not yet been proved."

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 1, 1922.

MUSHROOM POISONING.

POISONING by mushrooms, in spite of the fact it is on everyone's lips, is by no means a common occurrence. In fact, it was classified by the late Dr. Stevenson of Guy's as *rare*. Popular talk would, however, place it amongst the foremost of food poisons, and everyone regards eating them with some suspicion. Yet everyone considers him-

self or herself as an authority on what mushrooms are safe to eat and what are not. Most declare it is not mushrooms that poison but toadstools, not knowing really the difference between the two, although professedly authorities on the subject.

The writer of this article had recently occasion to inquire amongst his medical neighbours as regards their personal experiences of mushroom poisoning. He selected twelve medical men of his acquaintance, for he himself had been the recent victim of an acute attack. Of the men of whom the writer inquired none was under 50 years of age, for from men of lengthy experience only was an opinion of value. The ages of the men ranged from 50 to 75, and from only one of the twelve was he able to get but a single instance of the kind through an experience varying from thirty to over fifty years of practice.

It is but fair to state that of the twelve men selected most of them were in practice in London, but all of them had been born and brought up in the country, so that neither in their boyhood days nor in their middle or old age had they come across cases of mushroom poisoning. It must be noted, however, that all of these men spent their holidays in either August or September in the country in Britain or on the Continent—that is, during the period of the year during which mushrooms are mostly consumed, so that their experience was gained in town and country. Yet one only could recall a single case in his experience. It is interesting to note that this experience was met with in London, not in the country, and was as follows.

The writer was given the following account by his friend, Dr. Salisbury Sharpe, being one of the twelve men of whom he inquired. He breakfasted on a Sunday morning with a partner with whom he was working. Sunday, curiously enough, is the one day in the week on which published accounts of the kind are mostly related. Is it chance that it should be so, or "is there anything in the fact" that it should be so? It is said mushrooms should be eaten the day they are pulled. It is evident in this instance that it was impossible they could have been so, for allowing that these mushrooms were brought from the country, they could not have been gathered so as to be on a London *breakfast* table.

At breakfast the two doctors sat down together, one of them uncovered the dish containing the eggs and bacon and mushrooms, drew his knife across the contents, and each ate half the quantity served up. The doctors parted company, arranging to meet at lunch at 1 p.m. Dr. Sharpe returned to lunch but his companion did not, and a telephone message informed him at 2.30 that his friend was in St. Mary's Hospital suffering from mushroom poisoning. When Dr. Sharpe reached his friend's bedside in the hospital he found him very ill, having had violent sickness, abdominal pains, followed (later) by purging and a rash on the skin of patchy distribution like an urticaria, and with a lethargy which amounted to a state of sopor. The attack after three days subsided, followed by weakness and some neurosis, and not until about three weeks was he fit to take up work. There was no doubt about the diagnosis; the incubation period lasted some two hours, followed by vomiting and abdominal pains, and the rash came out within three and a half hours.

In common with most food poisons, not all, but as in this case, only one of the two men was poisoned, yet they partook of the food off the same dish. Account for it as one may, this is a common tale, whilst in others all the persons are attacked. In the case of those who suffer, as in the present instance, the attack may be put down to an idiosyncrasy to mushrooms; but the victim had not this idiosyncrasy, as he had often eaten mushrooms before without any sequelæ.

In the case of the writer the tale is as follows:—

Whilst in the country in Hertfordshire he partook of a very *minute* helping of mushroom with bacon and egg at breakfast on Sunday morning, July 9, 1922, at 9.20 a.m. He had seen the mushrooms brought in the previous evening, July 8, and inspected them. The "mushrooms" were gathered, some from the orchard of the dwelling house and some from the fields in the neighbourhood. He remonstrated with those who gathered them that they were not to allow three of the mushrooms to be cooked; as they were of that variety of mushroom which, when over ripe, are known as puff-balls. All the men, including the bailiff, a man of some 55 years of age, said they were quite good, and they always ate them. The mushrooms were cooked by an experienced cook accustomed to work in the country and in town. These mushrooms were "sliced," not served up whole, and the writer partook of three pieces of the sliced mushrooms, varying when cooked from 1 in. to 2 in. in length, about ½ in. wide, and some ¼ in. in thickness. At 11.15 the same morning the writer was seized by shivering, which became intense in character, and he believed he had caught a chill from cold or a draught. He was busy talking at the time to a friend, and owing to the shivering went and shut the doors and the door-handles shook in his hand whilst doing so. He had to cease the conversation. The rigor went on for over three-quarters of an hour, and he was helped to go upstairs to bed—this proceeding he cannot remember, nor can he remember lying down on the bed, nor the fact that he had to have his clothes removed by those with him. He remembers, however, becoming aware of the fact that he felt marked distension of the stomach, some abdominal pain, and aching from head to foot. He then at once put his fingers down his throat and vomited twice or thrice a large quantity of tasteless fluid, after which he fell into a state of sopor (a word used by Stevenson in such cases) from time to time, and suffered from an intense headache. This state was followed by a "never-ending" waking and dozing night. He prescribed for himself a Dover's powder, gr. 5 tablet and 5 gr. aspirin. On the following morning he felt fit to return to London by a motor

starting at 8.20 a.m. He accomplished it in comparative comfort and quiet. About 4 p.m. on the Sunday, the first day of illness, he felt aching in the legs, especially the right, and pains about the middle of the calf and ankles at certain spots, and on Monday morning an urticarial rash from the knee to the ankle of the right leg. The rash varied between a pink and purplish hue in various spots, and when attempts were made to stand the whole leg seemed bursting with a surcharge of blood which passed off in a few minutes. Headache remained, and shivering recurred on being exposed to air by the blankets being displaced. There were no signs of phlebitis, nor of lymphangitis, and the glands in the groin were not enlarged. After getting to town he saw two or three patients that were waiting, and got to bed about 2 p.m. Temperature taken for the first time at 3 p.m. amounted to 99·8° F., and later, at 5 p.m., to 100·3° F. Dover's powder, 5 gr. and aspirin, 5 gr.; had a restless night, with intervals of some short sleeps on several occasions. Next morning, Tuesday, July 11, temperature below normal—97·6° F., and could take food. The leg rash, which had been dressed with lint soaked in a lead and opium and calamine lotion from knee to foot, was relieved. There was little pain in the leg when recumbent, which by this time had swollen to about twice the size (by measurement) of the left leg, which was "threatened" by a rash also. During the afternoon of Tuesday, 11th, the temperature rose again and reached 101·5° F. Same medicines repeated at bedtime and a quiet night.

Wednesday, July 12.—Temperature down to 97° F. in the morning and 102·4° F. during the afternoon, rash less purple and troublesome. Same medicine repeated at bedtime. Could take food fairly well. Rash less bright, but swelling rather more.

Thursday, July 13.—No recurrence of fever in the afternoon, swelling less, pains in body and legs much less, did not take medicines, ate well. Tried to see patients at home, but weakness sent him to bed.

Right leg still (July 28) swollen, no pain except on standing, and that not lasting more than the first few minutes when attempting to stand.

For past fortnight weakness the only feature. Had to stop all lectures, which previously amounted to four or five weekly, at the College of Ambulance. Seen by several medical men. Some doubt the diagnosis of mushroom poisoning. This, however, has to be set aside from the fact that on the same day three other people—one within 30 yards, another within 50 yards—and yet another in a neighbouring village, were attacked. The symptoms were similar, and the mushrooms were collected from the same ground.

A doctor's daughter from Harley Street reports that in Dorsetshire her sister was lately (within the past three weeks) poisoned by the same cause. On mentioning the fact to the gardener of the house where she was living, he said there had been several cases of the same disease near by, and he made this statement that on breaking the mushrooms this year there was present a condition of things he had never seen before. A small body of a material foreign to mushroom tissue is to be found in most of these met with in that neighbourhood. He had never seen it before. This is, of course, mere hearsay, but he is convinced of the presence of the body he mentions. The writer found in the mushroom he has gathered during the third week of July, 1922, that the stems seen in almost all mushrooms (real) is not white, but of a "squashy" character and of a dull ashen grey colour. It is needless to pursue this matter further without going beyond the colloquial accounts here given. So many opinions by botanists and gossips are held concerning mushrooms that it is mere waste of time to do anything else in the hope of settling this matter. One person gives this infallible test, another that; one says it is a matter of cooking; another that the mushrooms ought to be peeled first; another says that there are but few poisonous mushrooms; almost all are edible, if this or that is done to them, and it is impossible to get poisoned if people would only follow *their* test, *their* method of cooking, &c., *ad infinitum*. Sufficient it is that mushrooms through their active principle, muscarine, may become a deadly poison; that under certain conditions of an undetermined nature the poison assumes active properties; that the illness from certain mushrooms is of a specific type; and that the specific illness may appear after consuming mushrooms of the "approved" type.

Muscarine—Latin *muscarius*, pertaining to flies—a deadly liquid alkaloid $C_5H_{15}NO_3$ from various mushrooms, as the fly-agaric, *Agaricus muscarius* or *Amanita muscaria*. According to Dr. Mitchell Bruce, its action and uses are: Nitrate of muscarine is almost exactly opposed to that of atropine in every respect, except that it dilates the pupil when applied locally. It also contracts the pulmonary vessels. It has been used as an anhidrotic.

The treatment is in a doubtful way recommended as atropine; the writer found opium in the form of Dover's powder most satisfactory.

Mushrooms are said to contain more nitrogen than any other corresponding bulk of either animal or vegetable tissues, and it seems a pity if so valuable a food is "scared" away from our dietary owing to gossipy tales that only go to frighten us, it may be unnecessarily in many instances.

Annotations

Contribution to the Study of Trichophyton purpureum Bang, Trichophyton interdigitale Priestley, and Trichophyton "B" Hodges, also on Trichophyton "a" and Trichophyton "b" of the Author (Masao Ota, *Archives of Dermatology and Syphilology*, vol. v, No. 6, June, 1922).—After examination of the literature, together with the mycologic

investigations of his own material, the author arrived at the following conclusions:—

Trichophyton purpureum Bang, *Epidermophyton rubrum* Castellani, *Trichophyton* A. Hodges, and *probably* also *T. rubridum* Priestley, are one and the same organism; and as it has the character of an ectothrix, it would be more apt to call it *Trichophyton* than *Epidermophyton*.

The trichophyton species which Hodges has temporarily named *T. gypseum*, variety C, is most likely the same as *T. interdigitale Priestley* and a trichophyton which the author temporarily named *T gypseum*, variety 2. Since no one named the species prior to Priestley, it is only right to call it *T. interdigitale* Priestley.

There are varieties of *T. interdigitale*. The first is that of Kaufmann-Wolff and Curt von Graffenried. The author had three cases of this variety, and named it temporarily *T. gypseum*, variety 3. The second variety was temporarily named *T. gypseum*, variety 4. This resembles *T. lacticolor* in many respects. However, the animal inoculation gave a negative result.

The unidentified trichophytons which were obtained from ringworm of the glabrous skin, regarded as large-spored ectothrix, are divided into two groups: (*a*) *Trichophyton a*, which never exhibits a purple colour on the back of the cultures, and (*b*) *Trichophyton b*, which exhibits this colour.

Trichophyton B. Hodges in part resembles *T. gypseum*, variety 4; but it seems more closely related to *Trichophyton b* in the more important qualities. It is necessary to make a more thorough observation of these three trichophytons.

Experiments on the Variability in Susceptibility to Poison Ivy (E. D. Brown, *Archives of Dermatology and Syphilology*, vol v, No. 6, June, 1922).—The experiments performed lead to the following conclusions: There is a variability in susceptibility in different persons. There is evidence pointing to a variability in the susceptibility of a given person.

The time required for the onset of symptoms in nineteen clinical cases in which reliable data were obtained was from five hours to eight days.

The eruption may spread over the body without conveyance of the poison from the initial lesion through the agency of the hands or clothing.

The serous exudate flowing from the vesicles plays no part in spreading the eruption to other parts of the body.

There is no evidence which would suggest that there is such an entity as an insusceptibility to poison ivy.

A more plausible explanation is given for the conveyance of the poison through the air by insects rather than by dust or pollen.

Various Methods of Serum Application in Bacillary Dysentery (Pedro T. Lantin, *Philippine Journal of Science*, vol. x, No. 6, December, 1921).—The serum can be employed in a variety of ways—namely, per rectum alone (enema); intramuscularly; intravenously; in combined form, as per rectum and intramuscularly, &c.

The use of the serum per rectum (enema) is as yet limited; it produces beneficial effects in certain cases when the intestines become less irritable after starch enema with laudanum. The intravenous method produces immediate effects (better than intramuscular injection), but should be used with great caution, for there is danger of subsequent embolic formations under certain conditions. The combined method (serum per rectum and intramuscular injection) has given just as good results as any method of administering the serum, and is safer than the intravenous method.

Finally, the serum acts in a specific manner, but at the same time it may act as a foreign protein, producing non-specific antibodies. Above all it must be given early, even in cases where bacillary dysentery is only suspected, in order to produce good results.

Optimal Food Mixtures for Diabetic Patients (Russell M. Wilder, *Journal of the American Medical Association*, vol. lxxviii, No. 24, June, 1922).—An attempt is made to analyse certain principles underlying the dietotherapy of diabetes, and a method is proposed for calculating diets which will embody these principles. Such diets should, it is believed, satisfy four requirements.

(1) The diets should lower the metabolic rate of the patients 15 or 20 per cent. below that of an individual of like surface area, age and sex on an unrestricted diet. Under favourable circumstances this can be accomplished by making the food calories equal to the basal calory requirement of a fully nourished normal person of the same height, weight, age and sex as the patient, and adding an allowance of 20 or 30 per cent. for work if a sedentary occupation is permitted; an extra allowance is not made for the specific dynamic action of food or for movements in bed. This procedure is called low-maintenance in contradistinction to more rigid dietary restriction termed undernutrition. The advantage of a low-maintenance diet is that enough calories are provided to satisfy the energy requirements of the patient at his reduced metabolic level, thus avoiding continuous wastage of body tissue. It is more satisfactory to base calculation of the basal calory requirements on the four factors of age, sex, height and weight, according to Du Bois' standards for surface area, rather than on weight alone, as is the general custom. The calculation is simplified by a nomo-graphic chart published by Boothby and Sandiford.

(2) The protein quota of satisfactory diets should be restricted to the minimal value consistent with the maintenance of nitrogen equilibrium. This requirement is usually met by ⅔ grm. for each kilogram of the patient's body-weight.

(3) In order to reduce as far as possible the

sugar strain on the weakened sugar-burning mechanism, the carbohydrate quota of the diet should be restricted to a minimum consistent with safety from acidosis.

(4) A safe ratio must be maintained between the molecules of ketogenic material and molecules of glucose, such as those proposed, providing calories equal to the low-maintenance requirement of the patient; the ketogenic ratio which just fails to cause a clinically significant accumulation of acetone bodies, the so-called threshold ratio, is 2:1. This implies that the oxidation of two molecules of acetoacetic acid is accomplished in the presence of one molecule of glucose. The ketogenic ratio of the food mixture should avoid this 2:1 ratio by a reasonable margin of safety.

With the low-maintenance calory requirement, M, of the patient known and the protein quota, P, determined from the patient's weight, the carbohydrate quota, C, and the fat quota, F, of a diet that will satisfy requirements (3) and (4) may be readily determined from the formulas.

Formula 1. $C = 0{\cdot}024\ M - 0{\cdot}41\ P.$
Formula 2. $F = 4\ C + 1{\cdot}4\ P.$

Quinine and Pregnancy. Menace d'Avortement dans le Cours d'un Accès Pernicieux. Guérison par le Traitement Quinique (*Bull. Soc. Path. Exot.*, vol. xiv, No. 9, November 9, 1921).—The giving of quinine during pregnancy is usually considered extremely risky. Acton insists that this risk is not so great as is the risk of abortion on account of maternal high temperature affecting the fœtus in malaria, on condition that the os has not dilated. It has been proved in this *Bulletin* recently that fœtal malaria may occur, followed by possible fœtal death and maternal abortion. M. Rigollet urges strongly that sometimes in threatened abortion it may be absolutely essential to give quinine.

One of the cases under consideration was a young woman who had benign tertian malaria during the third month of pregnancy, with vomiting, diarrhœa, strong uterine contractions, coma, and a temperature reaching, at times, 40·8 C. Quinine was given intravenously and intramuscularly to the extent of 1·2 grm. one day, and 1·8 grm. the next. A general improvement and lessening of the pains was shown after a crisis which followed an intravenous injection of 0·3 grm. on the third day. After this a successful cure was effected under oral administration of quinine, which had previously caused severe vomiting, and pregnancy proceeded normally.

Transmission of Oriental Sore by Phlebotomus (Sergent, Parrot, Donatien and Beguet, Aragao, *C.R. Acad. Sci.*, vol. clxxiii, No. 21, November 21, 1921).—For some years past it has been suggested by various authorities, both in Biskra and in Mesopotamia, that phlebotomus is a probable carrier of oriental sore, but this has not actually been proved experimentally.

In 1921 the authors tried to prove the possibility of the disease being carried by collecting sand-flies at the endemic foci of Biskra, El Outaya and El Kantara, and despatching them to the Pasteur Institute in Algiers, where the disease does not occur. Out of the 2,346 flies sent (comprising *Phlebotomus papatasii*, 2,282; *P. perniciosus*, 8; and *P. minutus* var. *africanus*, 56), only 559 were alive on arrival, and these were divided into twenty-three batches.

Volunteers were inoculated by scarification of the arm with saline solution in which these flies had been crushed. One experiment was positive as a result of the batch of seven *P. papatasii* which had been crushed and inoculated. The wound healed well. About three months later a small papule was noted on the spot, which, on examination, showed many leishmania and the exact characteristics of oriental sore.

The conclusion was arrived at that sand-flies from endemic foci or oriental sore are capable of producing a cutaneous leishmaniasis which is similar both clinically and pathologically to oriental sore.

Anchylostomes recorded from Sixty-seven Post-mortems performed in Amazonas (R. M. Gordon, *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 2).—Six thousand eight hundred and fifty-seven anchylostomes collected from sixty-seven autopsies performed in Manaos, Amazonas, were examined, with the results recorded. A far higher proportion of *Anchylostoma duodenale* to *Necator americanus* (1:4·7) occurred in Amazonas than recorded by Darling for South Brazil (1:45). This high proportion of *A. duodenale* was shown to be chiefly due to the country dwellers in Amazonas, whose *A. duodenale* to *N. americanus* ratio was 1:3·2, while that of the city dweller was 1:12.

A. braziliense was found in four of the post-mortems.

The comparison of these worms and other two-toothed anchylostomes from dogs and cats in N. Brazil and India, and also from cats in South Africa, and dogs in West Africa, failed to show the difference claimed to exist by de Faria between *A. ceylanicum* and *A. braziliense*.

The Pathogenicity of Bacillus abortus and Bacillus melitensis for Monkeys. Studies of the Genus Brucella Nov. Gen. iii. (E. C. Fleischner, E. B. Shaw, M. Vecki, and K. F. Meyer, *Journ. Infect. Dis.*, vol. xxix, December, 1921).—The work is summarized as follows: (1) Virulent strains of *Bacillus abortus* in sufficiently large doses are pathogenic to monkeys. (2) *B. melitensis* is far more invasive than *B. abortus*. One or two feedings of one-thousandth the amount necessary to cause an infection with *B. abortus* is sufficient in melitensis infection to parasitize a monkey.

Abstracts and Reprints.

AN ETHEREAL EXTRACT OF STRAWBERRIES FOR THE TREATMENT OF SPRUE.[1]

By Aldo Castellani, C.M.G., M.D., M.R.C.P.,

AND

K. C. Browning, M.A., F.I.C.

(*A Preliminary Note.*)

The favourable influence of a strawberry diet on sprue has been known for some time. As it is difficult and expensive to get strawberries except in the short season, and, moreover, strawberries forcibly grown out of season do not seem to have the same beneficial effect, we sought a method by which the active principle or principles could be extracted and stored.

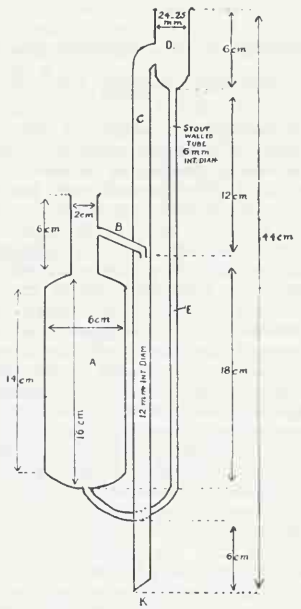
The experiments of Dr. S. S. Zilva (*Biochemical Journal*, 1920, pp. 494-501) and those of Osborne and Mendel (*Biochemical Journal*, 1920) on the extraction of antiscorbutic and antineuritic principles from cabbages and carrots suggested the method which was adopted. Dr. Zilva showed that it was possible to extract, by means of alcohol, the fat-soluble factor from cabbages and carrots, and that the alcoholic extract also contained the antineuritic and, to a smaller extent, the antiscorbutic factors. He also showed that if the alcoholic extract of cabbages and carrots were further extracted with ether, the ether contained a substance which promoted recovery and renewed growth in rats declining in weight on account of a fat-soluble factor deficiency.

After a number of preliminary experiments, the following procedure was adopted:—

Fresh strawberries were crushed with about 5 per cent. of their weight of absolute alcohol and filtered in a powerful filter press. The juice was then extracted for days in a continuous ether-extraction apparatus. The ethereal extract was immediately concentrated in a vacuum over phosphorus pentoxide, a small quantity of either starch or lactose being added. The residue was dried as completely as possible in a vacuum over phosphorus pentoxide, as this appears to ensure greater stability.

The apparatus used is illustrated, and is very convenient. To get the most rapid extraction by thoroughly mixing the solvent with the solution being extracted, a number of Raschig rings are placed in A. These consist of rings whose diameter is equal to their length. They can be made of any suitable material—for example, by cutting 5/16 in. aluminium tubing, 22 gauge, or from glasses. Prolonged experience has shown their value in extractions (*cf.* Bayer and Co., *Journal of Soc. Chem. Ind.*, 1919, 752a).

The extract we have prepared (mixed with a little starch) is of a dark red colour, has a granular-scaly appearance, is somewhat soft, and has a very



Continuous extraction apparatus for extracting a solution with a light solvent. A. Condenser is fitted at D. The solvent is in a flask at K. The solution to be extracted is placed in A, which is then closed by a cork. Small Raschig rings can be put in A to help the extraction.

powerful fragrant smell of fresh strawberries. A minute quantity of it has been kept in an amber tube for the last ten months (since last June), and apparently has not lost any of its characteristics, being of the same colour, and its fragrant smell being just as strong.

The experimental investigation of this extract is difficult, as sprue cannot be reproduced in the lower animals; we have to rely therefore only on clinical observations, but owing to the question of expense only a very small amount of extract was prepared, and our clinical investigation has been most limited. We may say that we have tried it in two cases of typical sprue in conjunction with the usual milk diet and alkaline treatment. It was given in 5-gr. doses three or four times a day and seemed to have a beneficial effect, apparently hastening the improvement in the general condition; but much further work will be necessary before it will be possible to come to any definite

[1] Reprinted from the *British Medical Journal*, May 6, 1922.

conclusion as regards its therapeutic effects. We have thought it advisable, however, to publish this brief note to enable other observers who might be interested in the subject to prepare the extract during the strawberry season, and to experiment further with it.

JAUNDICE IN THE NEW-BORN.[1]

By Sir Humphry Rolleston, K.C.B., M.D., D.C.L., F.R.C.P.

The physiological jaundice of the new-born, which occurs in about 50 per cent. of infants, becomes obvious on the second or third day of life, but is of short duration and needs no treatment. The explanation of this form of jaundice has never varied so much as that of the other forms of jaundice. The occurrence of the polycythæmia at birth and the probable subsequent hæmolysis have often suggested that the jaundice is hæmolytic rather than caused by an obstruction inside the liver. The absence of bile pigment in the urine, its presence in the fæces, and the comparatively slight pigmentation of the skin show a resemblance to hæmolytic jaundice. Again, the method of van den Bergh of testing the blood-serum by Ehrlich's diazo reagent has shown that the bilirubin in the blood-serum in simple jaundice of the new-born is the same as that present in hæmolytic jaundice, and differs from the bilirubin in the blood-serum of obstructive jaundice, and is a valuable means of distinguishing between the two. The important practical point is to distinguish physiological jaundice from the graver forms.

Grave familial jaundice may be hereditary and is definitely familial. It resembles physiological jaundice in several points, but the prognosis is very different, the fatality in the case of the former being very high, while the latter is practically harmless. The history of other cases in the family is the surest guide. Two rare sequels may be mentioned—a green colour of the teeth and cerebral diplegia.

Treatment.—Pregnant mothers of previous infants dead of jaundice have been treated with biliary and intestinal antiseptics—hexamine salicylate of sodium, minute doses of calomel, and hydrargyrum cum creta, which has resulted frequently in the freedom of the infant from jaundice. Jaundiced infants should not be fed from the mother's milk, and minute doses of calomel may be given. Dr. Herbert Williamson has successfully treated by hypodermic injection of 5 c.c. of horse-serum daily until 20 c.c. had been given two cases of infants suffering from grave familial jaundice, in families in which previous infants had died of the disease.

Congenital obliteration of the bile ducts is accompanied by definitely obstructive and progressive jaundice, hepatic and splenic enlargement, and in the later cases by hæmorrhages. This clinical picture is the same as that presented by syphilitic stenosis of the common bile duct, but in the former there are other factors, which are lacking in the latter.

Infection spreading from the umbilicus, the skin, or from the intestine in the new-born is extremely fatal from septicæmia.

Chronic hæmolytic jaundice may be congenital, and at first closely resembles physiological jaundice. Exceptional instances of its association with congenital syphilis have been reported by Fournier and Joltrain.

[1] Abstracted from the *Practitioner*, July, 1922. Vol. cix, No. 1.

CONSTIPATION IN INFANCY AND CHILDHOOD.[1]

By Eric Pritchard.

In this article I intend to confine myself to a description of the causation and the cure of the common forms of constipation. In order that the condition may be treated rationally, accurate diagnosis is necessary, and the therapeutic measures employed must be based on the special ætiology of the case. The routine treatment by purgation and aperients is both unscientific and unsuccessful, and the injudicious use of such is undoubtedly the common cause of constipation in infants and children.

The normal functioning of the neuro-muscular co-ordinations concerned in the act of defæcation depends upon very delicate and sensitive reflexes, which may be seriously disturbed by the use of violent measures to set the machinery in action during the period of their development, and may take some considerable time to recover from the shock. The early history of a case of chronic constipation is usually as follows: A dose of castor oil is given during the early days of infancy to cure a temporary suspension of bowel function, followed by frequent enemata, suppositories, or doses of grey powder resorted to to counteract the usual obstinacy of the bowels which follows. The preventive treatment of constipation may be summed up in one word, "Education," the curative treatment in one word too—"Re-education."

The youngest baby is easily trained to respond to the suggestion of "holding out" or to the reflex stimulation of a soap dish applied to its buttocks. In the Hampstead Nursery Training School this method is successfully carried out even with the very youngest, and the use of purgatives is practically unknown. When babies are trained to have only two actions a day "at call" the motions are usually butter-like and definitely formed, thus giving better exercise to the musculature of the bowel than the mere gravitation of relatively fluid stools. In cases of temporary constipation in

[1] Abstracted from the *Practitioner*, July, 1922. No. 649, vol. cix, No. 1.

infants, even of two or three days' duration, it is better to wait for a natural action than to employ dynamite tactics. A little gentle massage for a few minutes before "holding out" encourages a natural result.

Diet is undoubtedly important, but not so important as regularity of habit and suitable training. The possibility of starvation, especially with breast-fed infants, must always be taken into account and remedied by careful estimation of the daily milk-supply. In bottle-feeding excess of fat is a common source of trouble, when an attempt to cure with olive oil or increased rations of cream is obviously irrational. Another cause of constipation, in artificial feeding, is an excess of protein, and there are many other faults of balance or deprivation of necessary accessory food factors which may indirectly lead to the same results. There must therefore be systematic education and training of the bowel function, and also a correction of all existing dietetic faults.

Constipation in Breast-fed Infants.—When constipation is due to some fault in the food, it may be a fault of quantity, when the total amount of milk consumed in the twenty-four hours must be estimated by a regular application of the "test feed," or of quality, when the error may sometimes be detected by having a mixed sample of milk analysed, though this is not always successful. Steps must be taken to remedy the defect. If the motions are hard, they can be softened by means of petroleum in some suitable preparation, but this naturally must not be used when the motions are already too fluid. Petroleum is invaluable always when constipation results from a deficiency of mucus.

When constipation arises from inertia of the intestinal musculature or owing to insensibility of the nerve-endings, drugs capable of increasing tonus or raising the degree of nervous excitability should probably be employed.

If in breast-fed infants constipation continues after the food had been adjusted, the educational régime may be reinforced by a small daily dose of the following aperient mixture:—

R	Tincture Aloes	...	...	♏iii
	,, Belladonnæ			
	,, Nucis vomicæ	...	āā	♏i
	Syrup. sennæ	...	...	ʒss
	Syrup. ficorum	...	ad	ʒi

As the condition improves the dose may be "tailed off" until daily action comes unaided. If the motions still remain hard, semprolin emulsion may be substituted in this mixture for the syrup of figs, or it may be given independently in doses of one to two teaspoonfuls after each feeding.

Constipation in Artificially-fed Infants.—In the case of bottle-fed infants it is easy to introduce temporary modifications in the food. If constipation is due to excess of fat, it may be wise to give for a few days a diet consisting of separated milk and sugar alone. If it is due to the giving of an excess of cow's milk casein, a temporary diet of whey, cream and sugar may be tried successfully. Careful attention must be given to the discovery as to whether the constipation is due to any deprivation of necessary accessory elements, such as organic salts, vitamines, lecithin bodies or extractives, and if any such fault is found, it must be corrected. The routine treatment of giving mannite, Mellin's food, &c., of increasing the cream allowance or the addition of olive oil or cod-liver oil, without reference to the causation of the constipation is thoroughly unsound, as such means may correct one pathological condition by producing another. It is in my experience wise in all cases of bottle-feeding to give regularly 3 or 4 oz. of vegetable and bone broth so that there may be no risk of mineral or vitamine starvation. The hygienic and drug treatment in the case of bottle-fed babies is the same as in that of breast-fed babies.

Constipation in Young Children.—The cause is generally defective training and the abuse of drugs, or is sometimes the result of a previous attack of enteritis, colitis, or dysentery. Much that has been said in connection with the treatment, prophylactic and curative, with violent purges and unsuitable feeding in infants is true also in the case of older children. The commonest dietetic resource in the treatment of constipation in children is to increase the total intake of fat, which is not at all a reliable cure. A table of quantities to show the average physiological requirements of fat for different ages is appended, and these quantities should not be exceeded. Porridge, figs, currants, &c., may produce an immediate effect in cases of constipation, but they may also lead to chronic diarrhœa or colitis. Observance, not the breach of, the cardinal rules of physiological feeding, must be aimed at. Care must also be taken to supply a considerable quantity of the food in the form of vegetables and fruits, since their cellulose framework fills up space in the bowel and imparts the required stimulus to the neuro-muscular elements so necessary for adequate peristalsis.

The drug treatment indicated in the case of infants is the same as for older children. The educational régime should be strengthened by the voluntary co-operation of the child. Physical exercises, designed to bring the abdominal muscles into play are most useful, and can be combined with massage and manual manipulation of the colon.

Medical News.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT. 69TH SESSION. APRIL-JULY, 1922.

With Distinction: Vassallo, Dr. S. M. (Colonial Service), Winner of "Duncan" Medal; Marshall, Squad Leader G. S. (R.A.F. Med. Ser.); Kellersberger, Dr. E. R. (Congo American Mission).

Passed: Lucraft, Dr. H. S.; Moody, Dr. L. M. (Colonial Service); Shepherd, Miss C.; Teague, Dr. O.; Schwartz, Dr. H.; Berlie, Dr. H. C. (Indian Medical Dept.); Gharpurey, Major K. G., (Indian Medical Ser.); Nath, Dr. V.; Young, Miss M.; Hunt, Lt.-Col. S. (Indian Medical Ser.); Beatson, Capt. B. F. (Indian Medical Ser.); Dunscombe, Dr. C.; Horsfall, Dr. T. M. M.; Varma, Dr. N. L.; Gupta, Dr. P.; Barker, Major F. C. (Indian Medical Ser.); Cursetzee, Capt. H. J. M. (Indian Medical Ser.); Cameron, Dr. D. I.; Bleakley, Miss N. E. (Church of England Zenana Mission); Kuriyan, Dr. A. T. (Colonial Service); Theiler, Dr. M.; Cottrell, Dr. A. R. (Church of the Brethren Missionary Society); Peacock, Dr. G. E.; Cave, Miss J.; Choksy, Dr. K. N.; Cottrell, Mrs. L. M. (Church of the Brethren Missionary Society); Gregory, Dr. J. L. (Colonial Service); Jones, Dr. J.; Norris, Miss M.; Pandit, Dr. N. V.; Rahman, Dr. W .M. A.; Loudon, Dr. J.; Murphy, Miss M.; Wood, Dr. W. W. (American Presbyterian Mission); O'Keefe, Miss E.; Maximos, Dr. Y.; Tewfik, Dr. A. H.

Correspondence.

THE END OF THE INTERNATIONAL SOCIETY OF TROPICAL MEDICINE.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

May 30, 1922.

DEAR SIR,—With a view to preventing misconceptions in the future, I would ask you to kindly publish the following communication in your Journal:—

The International Society of Tropical Medicine was founded on September 27, 1907, on the occasion of the XIVth International Congress of Hygiene and Demography, Berlin, at an informal meeting attended by forty-two gentlemen representing Brazil, France, Germany, Great Britain, Holland, Italy and the United States.[1] Provisional officers were chosen. Sir Patrick Manson was elected President by acclamation, and the writer was chosen Secretary-General and Treasurer of the Society.

A meeting of the Committee of Management took place in London on July 27, 1908, followed by a conference, at which Laws governing the International Society of Tropical Medicine were framed and adopted by delegates of the British, French, German and Dutch Societies of Tropical Medicine. A formal election of officers followed, Sir Patrick Manson and the writer being elected President and Secretary-General respectively, whilst Professors A. Laveran and A. Plehn were chosen as Vice-Presidents.

As time proceeded it became evident that the Society was destined to disappoint its founders, it being recognized that sufficient opportunities for meetings were afforded at International Congresses of Medicine and Hygiene. With the advent of the Great War, the late President and the writer concluded that the best course to pursue would be to end the International Society and distribute its funds to the national societies which had mainly contributed to the International Society's funds.

FINANCIAL STATEMENT.

At the meeting held in 1907 the sum of £7 18s. was contributed toward clerical expenses by voluntary subscriptions, whilst at the meeting in 1908 £1 5s. was subscribed for the same purpose, including the printing of the Society's Laws. Contributions to the funds of the International Society were subsequently received (1909-1912) from some of the National Societies, this money being placed by the writer on deposit account in the name of the International Society with Barclay's Bank, Limited, Cambridge.

The total amount received from all sources by the writer, with accrued interest added to January 1, 1921, amounted to £42 19s. 5d. This amount, after deducting a small sum for clerical expenses, was distributed *pro rata* to the contributory societies as follows after they had signified their formal assent to the proposal sent to them on October 7, 1921:—

AMOUNT PAID TO EACH SOCIETY.

	£	s.	d
Société de Médecine et d'Hygiène Tropicales. (Paris. Treasurer, Dr. L. Dyé. Rec't. 22, 5, 1922.) ...	16	4	6
Società Italiana di Medicina e Igiene Tropicale. (Rome. Treasurer, Prof. Levi della Vida. Rec't. 29, 1, 1922.)	10	16	4
Société de Pathologie Exotique. (Paris. Treasurer, Dr. Ed. Tendron. Rec't. 2, 2, 1922)	6	15	2
Deutsche Tropenmedizinische Gesellschaft. (Leipzig. Treasurer, Dr. A. Meiner. Rect. 22, 4, 1922) ...	6	4	2
American Society of Tropical Medicine. (Washington, D.C. Secretary-Treasurer, Dr. B. H. Ransom. Rec't. 6, 5, 1922.)	1	7	0
	41	7	2
Reserved for clerical expenses	1	12	3
Total ...	42	19	5

The funds of the International Society having been distributed in the manner above stated, and receipts from the several Secretaries of the Societies mentioned being now in my hands, it devolves upon me as one of the two surviving officers to announce the end of the International Society of Tropical Medicine, greatly regretting that circumstances proved inimical to its development. Strangely enough this event has almost synchronized with the death of Sir Patrick Manson and Professor A. Laveran, the late Society's most distinguished members.

I remain, Sir,

Yours faithfully,

(Signed) GEORGE H. F. NUTTALL.

Secretary-General and Treasurer of the International Society of Tropical Medicine.

[1] For further particulars see THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE, October 15, 1907.

Original Communications.

PREVENTIVE ASPECTS OF ENDEMICS IN MODERN TIMES.[1]

By Professor W. J. Simpson, C.M.G., M.D., F.R.C.P.

As science advances theories change, and so it is that the theories of to-day regarding endemic and epidemic disease are not exactly the same as they were in the early part of last century. Malaria, for instance, is no longer viewed as caused by emanations from marshes, nor yellow fever as spread by fomites on clothes and bedding, nor are plague and cholera now attributed to earth-born and air-borne agencies. That malaria was connected with marshes and plague associated with sick rats were facts which had been observed over and over again throughout the centuries. To account for these occurrences the theory of gaseous emanations from different sources was constructed. In the case of plague, the contagionists disputed this explanation of causation on the ground of its being carried from place to place by sick persons, or by the clothes of the sick, or by goods from an infected place. They were unable to establish the proof of their contention owing to the imperfection of the microscopes of the day. The discovery of bacteria and protozoa as causal agents of communicable diseases has altered our outlook, and given us a wider vision. The agents which had been suspected were made visible and could be traced sometimes in or on insects, sometimes in or on animals, and sometimes in both, often on food and in drink and on various objects. Laboratory research and the differentiation between the life-history and the mode of reproduction of bacteria and protozoa cleared up many obscurities attaching to infection and revealed new avenues for exploration. The mosquito proved to be the link between malarial man and the marsh, the plague bacillus and the flies between the sick rat and man infected with bubonic plague.

The soil might nurture some of the micro-organisms under certain conditions, but the vehicles by which they spread were evidently not gaseous emanations nor the winds. No time-honoured theory is demolished at once by any discovery. It takes a considerable time. The earth-born and air-borne theory of cholera causation survived long after overwhelming evidence, collected in England, Egypt and India, that the disease was mainly spread by infected water. As late as 1886 the Sanitary Commissioner with the Government of India held the old view. At that period, when there was an outbreak of cholera among soldiers, the camp was evacuated and men marched away from the prevailing wind in order to avoid the air-borne germs. The invariable success of the measure curiously tended to confirm the old view, as the men were by this procedure removed from the infected camp, and it was only when the cholera bacillus was found in water, milk, latrines and on flies in different places where outbreaks occurred that attention was specially directed to the removal of these conditions and the air-borne theory discarded.

The Application to Communities of Recent Discoveries.

When applied to communities, the value and utility of the discoveries of Pasteur, Koch, Laveran, Roux, Calmette, Kitasato, Manson, Ross, Grassi, Bignami, Reed, Carrol, Lazear, Flexner, Castellani, Bruce, Haffkine, Wright and a host of others in the latter half of the nineteenth century have been conspicuously great, and are likely to be greater in future, especially in the tropics. There is, for instance, the monumental work accomplished by Gorgas and his staff in Havana and Panama, abolishing yellow fever and malaria and rendering the zone a healthy area. There is the improvement of the health conditions of the West Coast of Africa, which once had the reputation of being the white man's grave, and where plague and yellow fever have been effectually dealt with when introduced. There is the reduction of the death-rate of the British Army in India to 4 per 1,000 per annum and the abolition of typhoid fever, which was formerly a veritable scourge among the young soldiers in India, and there is the excellent control of plague, cholera, enteric fever and typhus during the war. Each of these successes in the tropics and sub-tropics has been effected by a trained health service applying the knowledge that had been acquired by research.

But great as these achievements are, they are only a continuation in tropical lands of equally great successes in England obtained by the early pioneers in preventive medicine who had never seen the causal agents, but had only suspected them. One of the notable features of the eighteenth century, and particularly of the latter part, was the new standpoint from which endemic diseases in England began to be viewed. Opinion was veering round to the possibility of their prevention, and this was confirmed and strengthened by the instituting of investigations which assumed the form of collecting and comparing facts obtained from observation, experience, historical data and experiment. It was known that inoculation was employed against small-pox in the East, could it not be tried in England? Malaria was observed to lessen with drainage and cultivation, might this method not be extended? The investigations into the conditions associated with the endemic diseases of this country at that time did not possess the precision belonging to the researches of the present day, but the deductions drawn from them were sufficiently near the truth for the measures applied against the diseases to be successful.

The Navy led the way both in investigations and in the application of the knowledge derived from them.

[1] Read at the Third International Congress on the History of Medicine held in London in July, 1922.

In 1757 Dr. James Lind, a naval surgeon, published the means by which the ship could be kept free of infection and disease, and the sailors healthy, and how scurvy could be cured and prevented by attention to the food, the provision of fresh vegetables and fruits, and a regular supply of lemon juice. He himself devised a distilling apparatus to purify the water on board, and was, with Dr. Brocklesby, an Army surgeon, an advocate of open-air hospitals.

His views slowly gained attention, and when they were put into practice in individual ships proved successful. Dr. Blane, first as physician to the Fleet in the West Indies, and later as Medical Director-General of the Navy, grasped the important fact, that to be thoroughly effective this knowledge had to be applied in an organized and systematic manner in every ship. The order was given and carried out, and the result was a marvellous improvement in the health of the men, a great reduction in the number of the sick, and ultimately the abolition of scurvy, typhus fever and dysenteries as endemic diseases in the Navy, and this was before vitamines or the rôle of the louse in typhus fever, or of the micro-organisms of dysentery were known.

This remarkable success was needed badly, and proved to be of the greatest service and of the highest importance to the safety of the nation, because the wastage due to fevers, scurvy, dysenteries and ill-health had been so enormous, that Sir Gilbert Blane in later years wrote that unless some means had been discovered and put into practice of preserving the health and lives of seamen, and had the mortality been as great between 1793 and 1815 as it had been in the American war, the whole stock of sailors would have been expended, and the commerce of the country could not have been able to supply the demand of the Navy.

The Economic Value of Preventive Measures.

In addition to the saving of sickness and mortality, the economic value of the practical application by a trained staff of the knowledge acquired of the causes and vehicles of endemic and epidemic disease, whether obtained in the laboratory or the field, is immense.

Gorgas's work made it possible to cut a trade route through an area notorious for its yellow fever and malaria, and at the same time demonstrated the practicability of making the tropics healthy and fit for the white man to live in. Blane's work consisted in helping to save a nation at a most critical period of its existence; while Jenner's substitution of vaccination for inoculation against small-pox, in the eighteenth century, subsequently conferred a world-wide benefit. It was also the forerunner of all the protective inoculations that are practised by the medical profession at the present day.

Later the same methods of inquiry into disease and subsequent application of the knowledge acquired were adopted for the towns of England, and it is due to this practice that the evil effects of the insanitary conditions brought about at the beginning of the nineteenth century by the birth of the industrial period with its crowding into towns, and rapid building of unhealthy houses, without reference to its production of insanitary slums were afterwards at an immense cost mitigated when realized; and that England later succeeded by its health organization and health reforms in the Victorian era in reducing the death-rate from all causes, from phthisis and from infectious diseases. Owing to this two-fold policy England became a leader in sanitary science and health administration, and it might have been a leader in town planning had Sir Christopher Wren's original plans, after the Great Fire of London, been accepted for making London the healthiest and most beautiful town in the world. If Wren's advice had been taken for London without modification and adopted for towns since sprung up in the country, what an enormous saving there would have been of human lives from tuberculosis and other diseases that have been annually sacrificed on the altar of the slums. It is less expensive to prevent slums than to demolish them and provide the same number of houses and accommodation on healthy lines.

The Relationship of Animal Diseases to Man.

A relationship between the diseases of animals and man long suspected has been established for certain bacterial diseases, and has been shown to be probable for trypanosomiasis. This opens up a very rich field for research which is likely to be of practical value.

We are in a better position now than formerly to investigate these problems, though for some diseases the causal agent has still to be discovered. More is needed not only in the direction of ascertaining the relationship of animal disease to man, but also of plant diseases to those of animals and man. My investigations in India led me to the conclusion that small-pox and some of the diseases of animals that pass under the name of rinderpest are intimately connected, that cholera was not infrequently associated with diarrhœal disease of calves, and that other epidemic and endemic diseases than plague were spread by rats. Investigations pursued, especially in those countries where domestic animals and man are living together in the same dwelling, and the grain is subject to disease may help us to understand, forestall and prevent the endemicity of leprosy, small-pox, measles and other diseases, and to understand the causes of periodicity, of reduction and exaltation of virulence, of the rise and progress of epidemics and pandemics, and their retrocession. What do we know of the recent pandemic of influenza, whence it came, and whither it went? The most we know is that it cost the world millions of lives. There is much more to be learnt about plague than that it is a disease of rats, though even this knowledge has been extremely valuable from a preventive point of view.

It is in the tropics that endemics due to bacteria, unlike those caused by protozoa, threaten periodic-

ally to become epidemic, and owing to rapidity of travel and changed conditions of commerce threaten other parts of the world. The International Boards in Egypt and Constantinople have not been able by their quarantine measures to prevent plague passing their frontiers to other lands, though they have been useful in preventing mass infection; nor can they be of any use in preventing importation from the West, as happened when plague was brought by ships from South America to Capetown and to England. At the present time plague, which is slow and halting in its progress, is gradually dotting itself over many countries of the world, waiting, as it always does, for a favourable season to gain further ground. The disease has been reported this year not only in countries east of Suez, but also in Egypt, Northern Africa, Russia, Greece, Palestine, the Azores, Mexico, Brazil and Peru. Thirty years ago it was considered as a disease that was dying out, but during the last quarter of a century it has re-established itself on every continent, and possesses the capacity of being a menace to the world. It has already demonstrated what it can do under favourable conditions. For instance, since its importation into Bombay from China in 1896 it has destroyed in India some 12 million lives, and still continues. Recently there were 8,000 deaths from plague in Uganda, which is an old endemic centre.

The Practical Aspect.

Turning to the practical aspect of these questions, it is necessary to separate what is known from what is unknown in order to concentrate our health measures on the former and our researches on the latter. It is the application of our present knowledge that is badly needed in the tropics, and it is there also we can best solve the problems connected with endemics and epidemics, whether in man or animals. Malaria, small-pox, typhus fever, dysenteries and beriberi and pellagra, instead of scurvy, are among the most common endemic diseases in the tropics. They are practically the same diseases as were endemic in England in the eighteenth century, and whose endemicity was abolished before the era of bacteriology, parasitology and vitamines, and there is every reason to affirm that, with our additional knowledge, these diseases can be prevented and abolished in the tropics by much more rapid and surer methods than was the case in England. There are other endemics in the tropics, the most common being ankylostomiasis. The Rockefeller Foundation has demonstrated by their commissions in different parts of the world that it is a disease which warps both body and mind, and causes much of the lethargy among the labourers of certain native populations. This disease is readily vulnerable to sanitary conditions and treatment. It is the same with bilharziasis; sanitary measures and treatment can get rid of it. Elephantiasis is another endemic disease disfiguring its victim. We know the conditions that cause it, and the measures that should be taken to abolish it and free the next generation; and yet they are not taken.

Leprosy is another loathsome disease. We know its causal agent, but not the reservoirs or vehicles by which it maintains its endemicity. Why is the problem not tackled? Plague, cerebrospinal meningitis, cholera, small-pox and sleeping sickness are continually taking their toll of lives in some part of the tropics. If India and Southern China be excepted, tropical lands are not teeming with large populations. On the contrary, wherever one goes, especially in Africa, one is impressed by the paucity of the population and the empty lands. They cannot afford to be losing their population by preventable diseases, which at present is a terrible drain on them.

Enough has been said, I hope, to show the urgent necessity of devising better means than exists at present to save the population in the tropics from preventable disease. My experience in the tropics is that, notwithstanding the valuable and splendid work that has been accomplished by sanitary commissioners, sanitary and medical officers, most of whom have been trained in the Schools of Tropical Medicine, no health administration is complete or able to deal effectively and satisfactorily with the endemic diseases of the tropics and with the conditions that favour their prevalence, until its organization is conceived on a wider basis than at present. That wider basis is only economically to be obtained by adding to that which now exists a trained staff from the indigenous population. For that purpose medical and engineering colleges are needed in the countries concerned to supply an auxiliary medical, sanitary and veterinary service.

Conclusion.

In conclusion I would urge:—

(1) That there is sufficient known of the ordinary diseases in the tropics and their mode of prevention to justify the creation of a special sanitary service in each of the Colonies by the nations to whom they belong, in order to prevent and abolish these diseases.

(2) That such a sanitary service is imperatively needed owing to the great wastage from preventable disease in the tropics, and is urgent because of the small population in each country and the necessity of preserving it.

(3) That such a service can only be thoroughly effective when it is composed of a native agency fully trained and well supervised by highly trained experts.

(4) That the organization should include arrangements for (*a*) investigation and ordinary routine laboratory work, and for (*b*) research in the laboratory and the field on the more obscure endemic diseases.

(5) That to facilitate research and preventive measures it would be of much advantage for comparison to have regularly included in the valuable statistical data furnished by the Office International d'Hygiène Publique and the American Public Health Administration similar information concerning (*a*) the epizootics in the countries concerned, such as

plague, rinderpest, cattle plague, foot-and-mouth disease, anthrax, &c.; (*b*) the diseases affecting plants, grains and crops; and (*c*) any extraordinary appearance of insects and vermin and of swarms of locusts, caterpillars, &c. All these, with the localities in which they occur, should be chronicled with the epidemics of man.

(6) That an effort should be made to map out the more permanent endemic localities of influenza, small-pox, plague, cerebrospinal disease, trypanosomiasis and leprosy on similar lines to those employed by the Rockefeller Foundation in regard to yellow fever, and that these should be studied from every known point of view by special commissions, financed by voluntary associations. Imitation being the sincerest form of flattery, we have founded a Tropical Disease Prevention Association in this country, and we hope later on, when we can get our rich men interested, to be friendly rivals to the Rockefeller Foundation in their great work in endeavouring to solve some of the pressing health problems of the tropics. The spirit of exploration, discovery and enterprise pervades the British to-day as strongly as in the past. Financed by the wealthy, there are expeditions to the Antarctic to find out what is there, to Mount Everest to scale its heights, to the tropics in the search for orchids, oil, gold, tin and other treasures. Why not expeditions to solve the great problems in their permanent home of these disabling and destructive diseases? I am sure once the vast importance and economic value of such investigations are understood a sufficiency of money will be raised to enable the Association to carry out its aims.

PASSAGES OF MEDICAL INTEREST FROM THE WEST INDIAN NOTE-BOOKS OF Dr. LOUIS WESTENRA SAMBON.

(*Continued from p.* 231.)

Bridgetown Dwellings.

A house to house inspection of the poorer quarter proved interesting, and gave me a useful insight into the domestic sanitation and mode of living of the coloured Barbadians.

Some of the dwellings were neat, well-constructed cottages, raised from the ground and provided with verandas and gaily-painted "persiennes," others were dirty, dilapidated little hovels, the building materials of which had been old packing cases and broken kerosene tins. One was so small that it looked like the tub of a black Diogenes.

The majority of dwellings were small wood cabins 14 ft. to 15 ft. long by 9 ft. to 10 ft. wide. Usually they were divided into two compartments: a sitting-room or "hall" and a bedroom. Sometimes a third room was added, and joined either to the bedroom or to the hall, but always at right angles to the main building, so as to give the whole the form of the capital letter L, whence the name of "L extension."

Each cottage had a small back yard with sometimes a kitchen-shed or a closet, and almost invariably either hog-pen, hen-coop, pigeon-house, or dog-kennel.

The walls of the rooms were either bare or painted, seldom papered; but I saw a bedroom plastered with old copies of the *Barbadian Standard*, and a sitting-room, the paper hangings of which were vignetted pages torn out of a French draper's catalogue.

The furniture varied considerably in quality and condition. There were solid mahogany dressers and rickety pine tables, Vienna chairs of twisted wood, with or without seats, upholstered ottomans very much worn, and empty provision-cases, used both as tables and chairs. The crockery also varied greatly from Minton porcelain to Chalky Mount earthenware and split calabashes. In one house gaudy oleograph pictures in gilt frames decorated the walls; in another they were fouled by crushed bedbugs.

I was not always allowed in the sanctum of the bedchamber; those I did see were, as a rule, almost entirely filled by the family bed or its substitutes, and by clothes and rags of every description hanging on cords stretching across from wall to wall. The parlours were more accessible and contained the most heterogeneous articles, such as tamarind-seed baskets and gramophones, tanias and hymn books, paper flowers, antimacassars and alarm-clocks, folding deck-chairs, coconut-shell vessels, tin-openers, swizzle-sticks and sewing machines; a strange assemblage of things representing, some the most primitive, others the most advanced civilization. But the part of the dwelling which interested me most was the back yard. As a rule it was a filthy place, but it often contained some attrahent object in the shape of a native alimentary or medicinal plant, or, maybe, a water-cask full of the wriggling larvæ and bobbing pupæ of the Tiger Mosquito.

The privies, few and far between, looked like sentry boxes. Some of them were quite new; indeed, one of them was so very new and neat that it had been turned into an orchid house, a neighbour's privy pit being used instead. As a rule an ordinary wine bottle was seen on the closet wall hanging to a nail by means of a string tied round its neck. It contained sea water, a remedy prescribed of old by Hippocrates, and now very generally used by the Barbadians as a mild aperient; about half a gill is taken in the morning every other day. One of the closets was embowered by a magnificent castor-oil plant!

Those who have no privy keep a cask or a bucket for the excreta and hide it in some part of the yard, where it may be screened by a bush or some pieces of sackcloth. In a house in Duke's Alley a butter-keg was used as the receptacle, and I found it concealed in a small tin trunk. The inhabitants of the coast empty their pails into the sea, but those of the interior use privy-pits digged in their own back yards and called "house spots." One

woman whose child was suffering from enteric fever went on emptying the germ-laden wastes of the patient in a corner of her compound beneath an old Sand-box tree. In the circumstances, soil contamination must be very extensive, yet seldom was there any offensive smell in the little back yards. Earth is truly a wonderful deodorant. On one occasion, having noticed a fœtid offensive odour, I discovered that it was due to the indoloid smell of the "Dunk-tree," which not infrequently is found by the side of negro dwellings.

Useful Plants.

As a rule, nobler and more useful plants grow out of the over-manured patch. The most common of all is the Banana, one of the earliest cultivated plants. Its fruit, with seeds now practically obliterated, is the "daily bread" of millions throughout the tropical belt. Its long, broad leaves of glossy light green, a charming ornament in the landscape, are put to every possible use. They serve as baking-trays, dishes and plates, tableclothing, bedding, packing material, cordage, umbrellas, fodder and manure. I have seen them used as gutters beneath the eaves of shingle roofs, and a Mohammedan tradition tells us they were used for girdles by Adam and Eve. Other common plants of the back yard are the Papaya, or Melon-tree, which has the singular property of rendering tough meat tender by means of a proteolytic ferment contained in the acrid juice of its leaves and fruits; the Calabash, or Gourd-tree, a vegetable juggler, through the bark of which burst out, in the shape of stem-fruit, all the basins, cups, spoons, bowls, pots and bottles of the negro cabin; the Malayan Breadfruit-tree also, which ever since its importation in 1793, has stood by the West Indian cottages with large hand-shaped leaves, mixing, kneading and moulding its bracts and fruits into rounded masses of well-raised dough ready for baking and diamond-scored like many Spanish, French, Belgian and Norwegian loaves. By the side of the Breadfruit-tree, the Avocado or Alligator Pear-tree may be found proffering goodly rolls of richest butter, enclosed in thick green pear-shaped skins, curiously like the cheese-coated butter-rolls suspended from the ceilings of cheesemonger shops in Southern Italy.

By the seashore it is the queenly Coconut Palm that shades the cabin and supplies meat, drink and utensils. In waste places the food-giver is the grotesque Prickly Pear; it brings an abundance of sweet, attractive fruit on its forbidding limbs, consisting of thick, flat, oval joints studded with tufts of spines.

Wherever the soil is fertile, numerous plants crowd round the dwelling, some covered with blossoms, others laden with fruit. Like the genii of Arabian tales, they come from all parts of the world, bringing valuable gifts. The Persian Pomegranate, in gorgeous array, brings caskets full of crimson rubies; the native Frangipani gives large fragrant flowers, which the Barbadians put amongst linen as we do lavender; the Banana plant carries beneath its satin wings huge clusters of seedless figs; the Mammee-tree, a many-breasted goddess of the Caribbean forest, presents its large, flesh-tinted, nippled fruit; the Oriental Mango comes burdened with long, heavy bunches of plum-like drupes, often surpassing in flavour the most delicious peach; Indian and African Melon-plants scramble up, trailing large, shining globes of luscious food, and the Chinese Orange-tree, shedding the perfume of its waxen flowers, lifts golden goblets brimful of ambrosia. Like Brutus at Delphi, the Abyssinian Coffee-tree carries chaplets of red berries, concealing the precious gifts of energy and lucidity in twin beans clasped like hands at prayer, and the stimulating Tobacco plant, styled "holy weed" by some, "devil's herb" by others, follows, unfolding its paper currency of large, thin, crisp, yellow leaves. Beautiful creepers rush up like dancing girls with snow-white stars in their foliage, or bejewelled with blossoms of pink, fawn, blue, or rainbow hues, while the torch-bearing Poinsettias raise whorls of flame-coloured leaves at the extremity of their branches, and the Flamboyant trees delight the eyes with innumerable bunches of flowers heaped into vast piles of blazing scarlet.

The lofty Tamarind drops pods full of thirst-quenching pulp from its cloud-like foliage, and with it come the juicy Shaddock and the juicier Lime, the Sour Sop and the Sweet Sop, the Barbados Cherry, the Star Apple, the Guava, and many other plants yielding delicious fruit, like Pineapple and Sapodilla; distilling sweet benzoid scents, like Jasmine and Stephanotis, or displaying gorgeous blossoms, like crimson Hibiscus, purple Bougainvillæa and the Pride of Barbados (*Poinciana pulcherrima*), whose butterfly petals and long stamens are a perfect glory of scarlet and gold. Even the stately Royal Palm have I seen, by the side of the humblest of human hovels, raise its offering of noble dark-green fronds on a straight, smooth, ash-grey column 100 ft. above the ground.

Food and Cooking.

As a rule, I found the women hard at work, some cooking, others washing clothes or ironing, all chattering and laughing good-humouredly. One chocolate-coloured lady was making "grater-cake" or coconut candy and graining her sugar with a long wooden spoon; another was busy filling hog's guts with hog's blood, hog's fat cut in dice, chopped potatoes and spiceries, the result being a black pudding mixed with potato instead of oatmeal.

It was interesting to find out what the people ate and how they prepared their food, though I must say that I was surprised at the variety of their fare and the excellency of their cuisine. In one cabin a savoury stew was being prepared with rice, pigeon-pease, haricot beans, pod-peppers, sweet herbs and lard. It was to be eaten with salt fish. In another cabin the *plat du jour* was the

favourite "cucu," a kind of porridge or "stir-about" made of yellow maize meal poured very gradually into boiling water, previously used to cook the mucilaginous pods of the okra plant (*Hibiscus esculentus*), stirred briskly over the fire, then set back to cook slowly until done, and finally seasoned with salt, pepper, butter, or lard and the sapid okra pods. Sometimes a little cassava flour is added to the mixture to give it mellowness. This "cucu" is a very ancient dish. Abul-Abbas-el-Nebati, a native of Seville, learned in plants, who visited Egypt in 1216, states that the green pods of the okra plant were eaten with meal by the Egyptians.

An excellent and truly Caribbean dish is the well-known "pepper pot," a ragout made of all kinds of flesh (pork, venison, fowl, turtle, iguana, fish) stewed with chillies, molasses and cassareep. Cassareep is the inspissated juice of the bitter cassava (*Manihot utilissima*), a brown, spiced extract, not unlike Chinese soy, which communicates an extraordinarily savoury taste to the mixture. The juice of the bitter cassava contains prussic acid and is therefore poisonous, but long-continued boiling renders it harmless. Owing to the antiseptic properties of cassareep, molasses, and chillies and to the frequent re-boiling, the pepper-pot is kept going indefinitely. Indeed, like Baucis's miraculous pitcher, it is never empty, more meat, peppers, molasses, or cassareep being added as required. There are families in Surinam who pride themselves in possessing pepper pots of twenty, thirty, and forty years' standing.

Fish enters largely in the dietary of the Barbadian. The kinds eaten are numerous, and they differ greatly in size, shape and colour. One of the most esteemed is the Red Snapper (*Lutjanus aya*), a large perch, with colouring as gorgeous as that of the Golden Carp. Other excellent fish are the King Fish (*Menticirrus nebulosus*), the Spanish Mackerel (*Cybium maculatum*), the Blue Parrot (*Pseudoscarus*), and the Flying Fish (*Exocetus*). The flying fish is very abundant at times, and is either grilled, fried, or wrapped in a plantain leaf and baked under the ashes. The larger fish are usually stewed; the smaller kinds, collectively called "Batter-fish," are steeped in a batter deeply yellowed with the red waxy testa of the anatto seeds, and fried in lard, cotton-seed, or coconut oil.

"Sea eggs"—that is to say, the roe or egg-masses of the edible Sea-Urchin—are considered a great delicacy. I have seen divers gather these prickly echinoderms round the Bathsheba coast, whilst on the shingly beach their women-folk heaped the egg-masses of several urchins in the wonder-box of one, covered the filled-up shells with cornets made of the leaves of the Shore Grape (*Coccoloba uvifera*), and baked them in ovens deftly made out of empty kerosene tins.

The Barbadians eat mutton, goat, pork, dolphin and hump-backed whale, duck, fowl, pigeon, turtle, lobster, land crab, oyster and giant strombus, preparing them in many appetizing ways with great variety of condiments. But salt codfish and fat salt pork are eaten almost daily, while plenty of oil or lard is used in the preparation of food.

Vegetables are plentiful, many of them delicious, wholesome and nourishing. Some contain a considerable amount of starch and take the place of our bread and potatoes. The more common are: Indian corn (*Zea mays*), breadfruit (*Artocarpus incisa*), sweet-potato (*Ipomæa batatas*), plantain (*Musa sapientum*), Yams (several species of *Dioscorea*), tanias (*Colocasia*) and Cassavas (*Manihot palmata* and *M. utilissima*). The young cobs or ears of maize, while still tender and succulent, are eaten either boiled or roasted. The breadfruit, boiled, cooked in hot embers or roasted over a charcoal fire, until the rind is charred, is an agreeable farinaceous food, with a slight sweet taste suggesting the Jerusalem artichoke. It may be cut into thin slices and sun-dried, then toasted when required. Not infrequently it is mashed and made into a pudding with sugar, eggs, nutmeg or cinnamon. The sweet-potato also is boiled, baked, fried or made into puddings with milk, eggs, sugar and grated coconut; it may be preserved as a sweet-meat in syrup. The unripe plantain is either boiled or roasted; the ripe fruit is cut into thin slices lengthwise, dipped in batter and fried to a savoury brown. The yam, when in perfection, makes a good substitute for the mealy potato, and served with butter is truly excellent. The long tuberous roots of the tania, as a rule, are preferred to yams and sweet-potatoes, but they require to be well cooked, because they contain an acrid principle which is destroyed by heating; their flavour is not unlike salsify. The reddish root of the sweet cassava also is eaten boiled or roasted, but the larger roots of the bitter cassava contain hydrocyanic acid, and cannot be eaten until the poison has been completely eliminated. The roots are scraped, washed and grated over raspers made of boards studded with small, sharp fragments of stone. The grated pulp is put into long cylindrical strainers made of the leaves of the miriti palm (*Mauritia flexuosa*) and called "matapies." The matapie is suspended from the branch of a tree or from a beam of the cabin's roof, and a heavy weight is attached to its lower end. The weight causes sufficient pressure on the contained pulp to squeeze out the poisonous juice, which trickles down the sides of the narrow wicker-work strainer and falls into a large calabash placed beneath. The compressed pulp, freed from its deadly liquor, is then broken, sifted, dried in the sun, and finally stirred in large heated pans until it becomes as parched as kiln-dried oatmeal. The grated and pressed pulp, while still moist, is made into either thick "bammy cakes" or thin "cassava cakes" by heating flattened portions of the meal, first on one side and then the other, on large, flat, round irons called "baking stones" in reminiscence of the older implements, then dried in the sun. The thin, circular cassava cakes are not unlike our oatmeal

cakes; they are good, crisp, crumbling cakes of delicate flavour.

Several Indian and South American pulses (*Cajanus indicus*, *Vigna catjang*, *Phaseolus mung*, *P. vulgaris*, *P. lunatus*, *Dolichos lablab*, &c.) are eaten either in soups or cooked with rice to supply the food elements lacking in the grain of *Oryza sativa*. "Red peas and rice" is a favourite dish. In Jamaica it is jocosely called "the Jamaican coat of arms."

Of green vegetables, the young and tender pods of the okra (*Hibiscus esculentus*), which taste somewhat like asparagus, are either served alone, or used for imparting flavour and a mucilaginous thickening to soups and stews. West Indian "spinach" may be the excellent calule (several species of *Amaranthus*), the young heart-shaped leaves of *Colocasia*, Indian kale (*Xanthosoma atrovirens*), purslane (*Portulaca oleracea*), or the leaves of the bitter cassava.

Large sweet peppers (*Capsicum*) are eaten in salads, or filled with a relishing *farce* of meat and rice and baked.

Mountain cabbage, the terminal bud or young fruit of the royal palm (*Euterpe* or *Oreodoxa oleracea*), either boiled or pickled, is a delicious vegetable, but to obtain a mere handful of food it is necessary to sacrifice a forest giant 60 to 80 ft. high—one of the most beautiful and ornamental of palms. The well-flavoured fruit of the West African akee (*Blighia sapida*), when in season, is much esteemed. The edible portion is the fleshy cream-white aril in which the three large jet-black seeds of the tripartite fruit are partly imbedded. There is a crimson membrane lining the aril which must be removed and the fruit need be perfectly fresh, because an enzyme develops in stale or bruised fruit which may cause poisoning. The edible portion is boiled and eaten as a vegetable usually with broiled salt fish, or is curried and served with snowy balls of rice. The green, white or purple eggplant (*Solanum melongena*), the orange pumpkin (*Cucurbitaceæ*), the sweet gourd (*Lagenaria vulgaris*), Hughes' wild cucumber (*Cucumis anguria*), the chocho (*Sechium edule*), and the unripe papaw (*Carica papaya*) are prepared in many ways, and pumpkin-pie is as famous in the West Indies as it is in New England.

The soft, unctuous flesh of the Avocado pear (*Persea gratissima*) resembles fresh butter and is eaten with a spoon. It has a delicate, rich flavour of steamed vegetable marrow drenched in butter. Cut in slices or cubes and dressed with pepper, salt and vinegar or lime juice, it makes a salad for the Olympians. Some add chopped onions, sweet peppers, potatoes and bananas cut into cubes and eat it with fish or lobster, others serve it with sugar and either wine or lemon juice.

Of sweets they have several. Rosella jam and guava jelly are far-famed. I have eaten of stewed guava served with cream prepared from the grated kernels of coconuts, and I shall be happy to do so again. A favourite sweetmeat is "Guinea-corn cake." This candy, made of parched Guinea-corn grains and boiled molasses, is like peanut, walnut candy, hard-bake, almond-rock, French nougat and Italian Torrone, a descendant of the ancient *Aquicelus* mentioned by Pliny the Elder, which the Taurini made of pine kernels and honey. A far more ancient and delicious West Indian sweet is the delicately flavoured custard sun-baked in a russet, heart-shaped skin-pipkin hanging from the branches of *Anona squamosa*, the Custard-Apple tree.

Cleanliness.

In several of the back yards, either in the middle of the ground patch or by the side of the house, were large, rounded beds formed of blocks and fragments of the porous coral-rock which covers so large a part of the island. On these stone beds, as on grass lawns with us, the washing is spread out and exposed to the bleaching action of the sun. As a rule, the presence of rockeries and wash-tubs in the yard indicate a washerwoman's dwelling.

The proper cleansing of body-clothes, bed-linen, and towels as an important factor in the health of the family seemed to be fully appreciated by the coloured Barbadians. Many a sable skin that no amount of washing could possibly turn white cherished that feeling of beauty, comfort and welfare attendant upon personal cleanliness. Their laundry work was good and certainly more merciful to the clothes than that of our great steam laundries.

Sometimes in the narrow alley you would meet with long rows of swarthy tub-nymphs rubbing and kneading clothes on their washboards, naked piccaninnies playing with soapsuds by their side. Or you might find black Penelope in her parlour preparing a stiffening from cassava starch-balls or the smooth, velvety arrowroot powder. Or, again, she might be ironing and folding underclothing or crimping and goffering the frills of a calico skirt.

Various kinds of soap are used, such as ordinary yellow or blue-mottled soap, but the oldest known and most interesting undoubtedly is Pomona's soap made into a cherry-like fruit with a shining, translucent reddish-brown husk that lathers freely in water, and is said to cleanse more linen than thirty times its weight of ordinary soft soap. It is called the Soap-Berry and grows on the Soap-Berry tree (*Sapindus saponaria*).

The Use of "Millions."

In a back yard overhung with tattered clothes fluttering in the sea breeze, beneath plantain leaves similarly split into shreds, I found a rain-water barrel teeming with the larvæ and pupæ of the Tiger Mosquito. On approaching it, a cackling hen, that was fostering a brood of ducklings, hobbled away as best she could, dragging a flat-iron tied to one of her legs In the adjoining back yard was another water-cask, but instead of "wigglers" it contained "millions," the mosquito's arch-enemy, and the coloured gentleman

who had placed them there so greatly appreciated the salutiferous voracity of the tiny fish (*Girardinus poeciloides*) that he assured me he never drank any other liquid than the fishy water of his improvised aquarium! In the middle of the yard was a pomegranate tree, round the branches of which had twined a Water-Lemon, or Granadilla vine. The yellow, plum-shaped fruit of the passiflora had been wrapped up in rags to protect them from birds. In a corner of the ground-patch were some coffee trees in full bloom, and around the fragrant white flowers hovered a pair of humming birds not much larger than humble bees, but arrayed in gemmeous magnificence and lustre. They darted from flower to flower to snap up minute insects or sip nectar, suspended on their whirring pinions and alighting never.

(*To be continued.*)

Carbon Tetrachloride in the Treatment of Hookworm Disease (C. N. Leach, *Journal of the American Medical Association*, vol. lxxviii, No. 23, June, 1922).—Carbon tetrachloride given in 10 c.c. doses to a man produced no ill-effects.

Twelve cubic centimetres of carbon tetrachloride removed all hookworms and ascarides.

The drug apparently had little effect on trichurides and oxyurides.

The Wassermann Reaction in Relapsing Fever (*Brit. Journ. Experim. Path.*, vol. iii, No. 1, February, 1922).—Out of the eighteen cases of relapsing fever examined from the point of view of the Wassermann reaction, eleven gave a positive reaction. Examination was only made once in six of the negative cases. All the others were tested repeatedly, and all became negative eight to thirteen days after the onset of the fever, except three, in which the positive reaction persisted for seventeen to twenty-one days. A transient positive Wassermann reaction may evidently then be expected as a constant phenomenon during the acute stages of relapsing fever.

Experiment on the Action of Ox-gall on Dysentery Bacillus (Knorr, *Cent. f. Bakt.*, 1 Abt. orig., vol. lxxxvii, No. 5, December 17, 1921).—It is found that bile has a damaging effect on Shiga-Kruse bacilli, varying in the different strains. In the early days of the illness the dysentery bacilli may be found to circulate in the blood, and it is naturally almost impossible to recover the dysentery organisms in bile media from the blood. The same result is found in the case of pseudo-dysentery bacilli, but in what is known as the Y strain the action is in no way damaging. From these experiments one is led to look on bile in Shiga dysentery as more or less a therapeutic agent.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 15, 1922.

AN UNTREATED CASE OF ACUTE MALARIA COMMENCING IN THE TROPICS REACHES BRITAIN.

IT is seldom an untreated and undiagnosed case of malaria newly home from the tropics reaches home shores. The writer met with such a case in July of this year (1922). The patient, a recently married woman, developed "fever" on her way

home. She came from East Africa, and on the passage home, whilst at Aden, was seized by severe attacks of vomiting and fever of daily recurrence. When I saw her in London she had been ill for thirty-six days. Vomiting was a promiuent feature when any food, solid or fluid, was attempted. Beyond a few aspirin tablets when headache and backache were severe, no specific drugs were administered. The reason for this was because neither of the doctors who saw the patient on shore or during the passage home believed the condition was due to malaria, but ascribed it to gastric ulcer, gastritis, gastro-enteritis, incipient "typhus," or perhaps typhoid; sweating at times was profuse, and she had lost over one and a half stones in weight. The husband, a sensible man, with an experience of ten years in East Africa, did not believe it to be malaria, and the doctor who was treating the complaint, not having been in malarial countries, awaited signs and symptoms for a day or two watching events. The diagnosis of malaria was confirmed by the mieroscope at Dr. Eastes' laboratory, when parasites were found. There was no splenic enlargement to be made out. At the time of consultation, 3.30 p.m., the temperature was 103·4° F., and it was "due to the usual afternoon rise," according to the patient. The day before, and many days before, the temperature had risen, to 103°, 104° or 105° F. usually between 2 and 6 p.m., but sometimes in the night, and sometimes in the forenoon. The treatment was that usually followed by the writer, namely, quinine, arsenic, opium and mereury—a modification of the old English fever powder. It was as follows:—

R	Quiniæ bihydrochloridi ...	gr. 3
	Acid. arseniosi	gr. $\frac{1}{6}$th
	Pil. saponis	gr. 1
	Hydrarg. subchloridi	gr. $\frac{1}{4}$th

Ft. pil. Sig.: thrice daily, 7 a.m., 12 noon and 5 p.m., in a cachet.

The first dose was given on Friday afternoon, and by Tuesday nine doses were given. The temperature did not rise on the Tuesday afternoon for the first time for forty days, and has not risen again at any time for the past fortnight. The patient went, after the temperature was normal (or below), from London to Glasgow, and has had no more fever. The really interesting point of this "cure" is the treatment, and the fact that it demonstrates the efficacy of the old English powder for the "ague." It shows once more also the poteney of polypharmacy in medicine. The "dock and nettle" form of treatment—in other words, "the one disease one drug" system of therapeutics is on the wane. Proofs of its inefficieney reached a elimax during the war, when several men in tropical practice, newcomers to the tropies, denounced quinine as useless in malaria, and gave it up as unreliable and practically valueless, *and* gave arsenic instead. They could not lay aside the fetish of their teaching, namely, one drug one disease, and gave arsenic alone. Had they combined the two better results would have followed, and this form of treatment is gaining ground in every direction. The writer would advise opium in small quantities combined with quinine and arsenic, and in it we have a compound which has the experience of many hundreds of years to recommend its being given. Warburg's tincture was used in the East some 4,000 years before the Vienna professor gave his name to the oriental compound with its twenty-two drugs. He added quinine to the old "fever mixture," and raised the number to twenty-three. The addition of mereury is in eonformity with experience of very ancient date; an initial calomel purge was the rule in many ailments—malaria included; but ealomel remains in the system, as we know, for at least three days after being administered, and as "the fever powder" was generally given on the morning following the calomel, it remained in the system, while quinine, arsenic and opium were being taken. In the pill recommended by the writer the opium is given as a wise addition to cheek the "feverishness" of ague, and also as a means of arresting the laxity due to the calomel. The writer strenuously advises the "old English" pill for ague; he finds it specific in cases of enlarged spleen from malaria, and finds that spleens of a goodly size may be confidently expeeted to disappear in four weeks, or even earlier, by its use.

As a prophylactic treatment a lessened quantity of this pill, as recommended above, is most efficient; instead of the daily dosing by 10 gr. of quinine by itself, which is so frequently administered to soldiers and civilians serving in malaria districts. A much smaller dose combined with arsenic and supplemented by opium, with or without the calomel ineluded, is preferable. The red blood corpuseles suffer less destruction.

A daily dose of the following is excellent as a prophylactic:—

R	Quiniæ bihydrochloridi ...	gr. $1\frac{1}{2}$
	Acid. arseniosi	gr. $\frac{1}{10}$th
	Pil. saponis co.	gr. $\frac{1}{3}$th
	Hydrargyri subchloridi ...	gr. $\frac{1}{25}$th

Ft. pil.

It must be remembered daily dosing by quinine, or even by 10 gr. twice weekly in consecutive doses, or, in other words, the prineiple of prophylaxis in malaria, is condemned as unscientifie; but the "world" demands protection and expects dosing, and it would be in any case wiser and less detrimental to give the quinine, arsenic, opii and hydrar: compound than a daily dose of 10 gr. or even 5 gr. of quinine by the small amounts recommended. Many believe in the legend that all people in a country with a malarial history have the parasites in their blood without any gross evidence of fever, and the small daily dosing would meet that belief. The writer has on many occasions referred to his own personal experience. Whilst demonstrating to a patient her blood below the microscope, who was at the time suffering from one of her many attacks of fever, and showing her the

parasites, he proceeded to demonstrate his own blood, healthy or normal blood as he presumed it to be. His surprise was great when he found his own blood richly endowed with malaria parasites, and that his own temperature was found to be 102° F. He had no suspicion that he had ever had "malaria," nor was he prepared to find the parasites in the blood. Moreover, the spleen could be felt below the left rib cartilages, so that he was suffering from chronic malaria, a fact that was well proven later, when the spleen within twelve months after was found to occupy more than half the cavity of the abdomen. How often does a man home from the tropics boastfully declare that he had never had malaria during all the, say, twenty years' residence in such and such a tropical district, but when being examined the spleen can be felt enlarged, or he gets his "first" attack of ague when landing in Italy or France to get home quickly? He blames Italy or France for the infection, or England even if it does not appear until after spending some months at home. This is, of course, an every-day experience. Had the writer taken a daily dose of the prophylactic pill such an occurrence as recorded above would not or could not have occurred, namely, the presence of an unknown infection with a marked febrile state. We have much to learn concerning the treatment of malaria; we have to get rid of the evil done by following the fetish of the giant doses of quinine, given by itself, to reduce high temperature. During the war, when numbers of medical men were suddenly brought from practices in Britain, and whose knowledge of the treatment of tropical ailments was hearsay merely, and expected quinine to reduce high temperature with alacrity, took upon themselves to condemn quinine as being unsatisfactory, and condemned it with aspersion as inefficient. Their notion was that the bigger the dose, the more sure the speedy reduction of the temperature and the more certain the cure of the disease. They showed their "fearlessness" by the administration of giant doses, forgetting, or being ignorant of the fact, that quinine is primarily an antiperiodic and not an antipyretic, and that giant doses of quinine inhibit its functioning powers. The action of quinine in a solution of cinchona bark is one thing, that of quinine by itself is another. As emetine is to ipecacuanha, as morphia is to opium, as atropine is to belladonna, so is quinine to cinchona infusions or decoctions. In their "natural setting" the alkaloids of these drugs are accompanied by the other "juices" and the other alkaloids peculiar to the plants; a polypharmacological compound is to hand, and the action of the most potent drug must be modified. The latter form is "fashionable" at the present day, hence the huge doses of quinine we are familiar with. It is a fashion that surely has had its day, and polypharmacy, which prevailed up to quite recent years, will shortly have its way again, and experience will assert itself and the dosing of quinine in huge quantities become a thing of the past. During very high temperatures—106° F. and over—quinine either by the mouth or by hypodermic injections is but a poor antipyretic, and at very high temperatures, say 107° to 110° F., it is doubtful if these powers, such as they are assumed to be, have any action at all.

In hyperpyrexia the danger should be dealt with by one of the quickly acting antipyretics of to-day, that the antiperiodics should be withheld until such time as the danger to life has abated by the administration of antipyretics such as aspirin, antipyrin, antifebrin as drugs, by diaphoretics, and by baths, ice, cold wet packs, &c. The writer has used antipyrin with speedy effects by hypodermic injection when the temperature in malaria was over 107° F. and still rising as long ago as 1887. Quinine had proved useless, but a full dose of antipyrin began to lower the temperature in ten minutes, and reduced it to 102° F. in half an hour. The writer has long ago ceased to give quinine when hyperpyrexia of 105° F. and over is present, and administered antipyretics hypodermically or by the mouth until a moderate temperature is attained, and resumes antiperiodics (quinine) only when the danger from hyperpyrexia has been thwarted.

The convenience of administration has much to do with these modern introductions in pharmacy; but it is the duty of the medical practitioner to see that the arts of the chemist are not allowed to lead him astray and by mere convenience of "drugage" lose much of the benefits which belong to the "polypharmic" setting in which Nature has placed most of our drugs derived from the vegetable kingdom.

Annotations.

The Cultivation of Leishmania infantum and Leptomonas ctenocephali on the Triple-N Medium (Lamberto Leiva, *Philippine Journal of Science*, vol. xx, No. 2, February, 1922).—Strains of *Leishmania infantum* and *Leptomonas ctenocephali* were used for cultivation experiments. Successful growth was obtained by using even a trace of blood provided the agar was very soft. The 2 per cent. agar plus 25 per cent. blood and the 0·5 per cent. agar plus 5 per cent. blood combinations seem to offer optimal conditions for growth.

Dysentery-like Diseases (Paradysentery, Paratyphoid) in Children and their Causes (Mita, *Journ. Infect. Dis.*, vol. xxix, No. 6, December, 1921).—Dysentery in children may be caused by different types of bacilli. The author thinks that at least 2 per cent. of the cases are due to organisms other than those of the recognized dysentery type. Paradysentery bacilli, after a long period of incubation, are capable of coagulating milk, and irregular colonies are produced. Ziehl's stain sometimes shows evident bipolarity in the organisms. A paratyphoid organism, which the author suggests should be called by the name "Paratyphoid X,"

causes dysenteric symptoms. This organism has no effect on saccharose, lactose, dextrose, and maltose, but in mannite and dextrose it forms gas and acid.

Charcoal Treatment of Dysentery (Kling, *Med. Klin.*, vol. xviii, No. 2, January 8, 1922).—The charcoal treatment of dysentery recommended by Singer some years ago is questioned by the author, after his experience in the treatment of about 3,000 cases. He and others of his colleagues are inclined to attribute the fatal issue of several of their cases to the balling of charcoal in the large gut, death coming suddenly from perforation. He quotes one case in which the charcoal was given to the amount of three teaspoonfuls daily in powder form, and was found to be retained for seven days.

Frequent experiments have been made in animals to show the absorbing power of charcoal over certain poisons, which thus become innoxious. Kruse, however, has proved that charcoal has no action on living dysenteric bacilli. The author is of the opinion that charcoal may possibly have some mechanical action which hinders the healing of the mucosa, and for this reason, and the others stated above, he is led to doubt the advisability of its use in bacillary dysentery.

Suppurative Orchitis due to Micrococcus melitensis (Pierre Lombard and Maurice Beguet, *Presse Med.*, No. 76, September 21, 1921).—It is found that in about 6 per cent. of cases of undulant fever there is an occurrence of metastatic inflammation of the testicle and epididymis. Suppuration seldom follows. The authors give an instance of one of their cases where, after complete bacteriological examination, the *Micrococcus melitensis* was isolated in pure culture from the testicular pus. The patient was cured by the removal of the affected organ and the giving of antimelitensis vaccine. In this article cases of Cantaloube and Cassuto are fully described. The presence of suppurative orchitis is very serious, owing to the probable distribution of separate foci. There is often a very great amount of pus and the gland is almost invariably destroyed. The only specific signs are those obtained by bacteriological methods, and thus diagnosis after convalescence is rather difficult, though during the fever it is comparatively easy.

Cinchonine as a Quinine Substitute (Guido Bini, *Policlinico Sez. Prat.*, vol. xxviii, No. 27, July 4, 1921).—Owing to the shortage of quinine salts during the anti-malaria campaign in Udine in 1919, the author used some 50 lb. of cinchonine sulphate. The writer came to the conclusion, by comparing the districts where each drug had been used prophylactically, that the value of the two alkaloids is the same. Not one case of hæmoglobinuria was traced to be due to the administration of cinchonine, and no other harmful effects resulted from it. In an issue of the *Trop. Dis. Bull.*, Acton maintained that cinchonine was twice as effective as quinine in benign tertian malaria. No harm seems to have been caused by its ingestion, though for many years past large quantities of it have been sold in India, considering that it constitutes 18 per cent. of cinchona febrifuge.

Sleeplessness in Infants (Charles E. Sundell, M.D., M.R.C.P., *The Practitioner*, vol. cix, No. 1, July, 1922).—A child's life rests upon the three things—food, warmth, and sleep. The greater part of the early years of life are spent in sleep. The power of relaxation, of which the capacity of suddenly dropping off to sleep, is a sign, is much greater in children than in adults. A child never suffers from insomnia, and any inability to sleep in attributable to some break in its usual routine. The cause of sleeplessness in a normal child is best discovered by a visit to the nursery at bedtime. Attention should be given to the temperature of the room, the screening of lights, and so on, and any gastro-intestinal discomforts should be avoided, such as hunger, thirst, flatulence, colic. Rocking should be avoided, as, if indulged in, it soon comes to be expected by the child. It invariably does more harm than good. The giving of sugar-balls is very harmful. Two causes of sleeplessness are irregular habits and excitement while awake. Bedtime should never be postponed for any reason, as the child exhausts its nervous energy and becomes too weary to sleep. The irritability of a sleepy child will vanish if sleep is encouraged, but will increase if sleep is withheld.

Regularity of habits and a regular routine should be carried out, and will ultimately produce the required results. Excitement during the day should be avoided. If sleeplessness is allowed to become a fixed habit, then treatment by drugs may be necessary, but these should be resorted to only when all other schemes fail. The aim should always be the re-establishing of the normal habit of sleep, and when drugs have to be resorted to, these should be given in diminishing doses. A suitable dose for a child of four months is 4 gr. of ammonium bromide with 12 minims of syrup of chloral, while for a six months' old child 3 minims of chloral might be added. Synthetic drugs are quite unsuitable for infants, and opium in any form should be used only to relieve acute pain, as a temporary measure of relief. The successful treatment of sleeplessness in infants calls for much skill and patience on the part of the practitioner.

Influenzal Sinusitis (Harman Smith, *New York Medical Journal*, vol. cxv, No. 12, June, 1922).—The ætiology of infected influenza sinusitis is not confined to influenza. The teeth play a minor part in sinusitis, but only of the antrum. In all cases of influenza there is reason to anticipate compli-

cations in the accessory sinuses or middle ear. In well-marked cases we find complications of otitis and pneumonia. Influenza bacillus gains access to the sinuses by continuity; the temperature often becomes normal. Local tenderness in inner canthus of the eyes. There is a rise of temperature; the patient is able to note the involved side.

Diagnosis.—(1) Localized pain; (2) pus in nose; (3) trans-illumination; (4) ray interpretation. There is pain on pressure over the canine fossa. The next step at hand is trans-illumination, by no means infallible; the positive findings show a marked reduction of light. The final element of diagnosis is the X-ray. Pain on pressure over frontal sinus is involved of the supra-orbital nerve.

Rôle played by the Sphenoid.—A number of cases experiencing lack of stamina and loss of energy, associated with ocular disturbance, have been eradicated by elimination of the sphenoidal sinusitis. Operative interference is only justified when in agonizing pain, high temperature, and failure in obtaining drainage. The indiscriminate puncturing of the antrum is neither necessary nor warrantable.

General Considerations.—The observations in this paper refer to acute or subacute cases incident to influenza infection, not to empyema by foreign bodies.

Dietetic Treatment of Chronic Arthritis and its Relationship to the Sugar Tolerance (A. Almon Fletcher, *Archives of Internal Medicine*, vol. xxx, No. 1, July, 1922).—Of 100 cases of chronic arthritis, reduction of diet alone appeared to result in the recovery of eight patients and in quite evident improvement in forty-three.

The sugar tolerance was decreased in the large majority of these cases, and this decrease showed no relationship to the severity of the disease.

Patients who have a low tolerance are much more frequently benefited by reduction in diet than those cases with a normal tolerance.

In certain cases of chronic arthritis, dietetic regulation appears to be the most effective form of treatment, and while the value of such treatment in an individual case cannot be determined with certainty, the lowering of the sugar tolerance is a useful clinical indication for this procedure.

Female patients derive greater benefit from such treatment than men.

Studies on the Nature of Non-specific Protein in Disease Processes (R. M. Greenthal and G. M. Brown, *Archives of Internal Medicine*, vol. xxx, No. 1, July, 1922).—There is a slight increase in the fragility of the red blood cells during the protein paroxysm.

There is no change in the percentage of reticulated erythrocytes.

There is a moderate rise in the urea and total non-protein nitrogen of the blood at the height of the fever resulting from the protein injection.

There is a moderate fall in the alkali reserve of the blood after the foreign protein injection. This is of short duration and a normal reading is soon obtained.

There is a decrease in total blood lipoids during the protein shock. This decrease is perhaps more marked than that which is found in fasting subjects not receiving the protein.

There is a slight rise in the blood sugar curve (Folin and Bendict) at the height of the reaction following the protein injection.

It is believed that the so-called protein shock and anaphylactic shock are different phenomena.

Notes on Early Attempts at Prophylaxis against Coast Fevers on the West African Station (Surgeon-Lieut.-Commander H. B. Padwick, D.S.O., *Journal of the Royal Naval Medical Service*, April, 1922).—This coast is the father and mother of all fevers; it is a history of malaria and yellow fever. The journals preserved are records of the commanding officers of the station in the middle of last century. H.M.S. *Trident* in 1859 had forty-four deaths in a white crew of 108 within two months of arriving at the coast until the discovery of Sir Ronald Ross. The journal says the firing party sent ashore gave a more honourable exit to a gentleman drinking himself to death and setting fire to the barracks. Water was collected in sails and stored on board. On the Coast a morbific influence was said to be the cause of "miasma." Assistant-Surgeon W. J. Eames survived three years on the Coast with only one attack of Coast fever. After his experience he inclined to believe that fevers on the Coast were divided in a manner too arbitrary. Eames does not feel competent to give an opinion. No doubt much is attributed to malaria, but he asks: "What is malaria?" The assumptions of the profession were right, though parties failed to find the missing link. Quinine was in general use as a prophylactic; it was Lind who suggested general use of quinine in his two epoch-making treatises, one on the prevention of scurvy and the other on coast fevers. When a newcomer arrived he was bled profusely. Lind said it was barbarous. We have pinned our faith on the use of the mosquito net. No net is of any use unless properly used. Surprise rounds at night three times a week until the net became second nature to the men. We have reduced malaria during the past commission from eighty-nine and forty-two cases during two recent commissions to four cases only.

A Case of Ascites with 40 litres Liquid ending in Complete Recovery (M. T. Ades Lingeris, *Medical Journal of South Africa*, vol. xvii, No. 11, June, 1922).—A native M'suto woman living near Rustenburg had a child at Christmas last. She says definitely that she was well before pregnancy, and confinement not long; shortly after confinement she was attacked by fever and vomiting, abdomen enlarged, legs swelled. She could not feed her child, which had artificial food. The skin

of the abdomen was distended and thinned. She was tapped, when there was drawn off a clear fluid, light yellow, and sticky. Five days later she was tapped again, when 12 litres more were drawn off; the fluid accumulated slowly, when at a third tapping 10½ litres further were drawn off. The patient recovered.

Schistosomum japonicum—Infection in a European (Bassett-Smith, *Journal of the Royal Naval Medical Service*, April, 1922).—The case, that of a young European, aged 24, serving in a man-of-war up the Yangtse.

History.—At Hankow on June 18, 1911, with four others went for a picnic, and bathed in a flooded area, water clear and not deep.

Subsequently they were attacked with fever and so-called bloodworm disease. Two of them—severe—returned to England, two remained at Hankow. In September a marked eosinophilia present, liver slightly enlarged. At Yokohama Hospital, large ova containing embryos, in stools; blood content abnormal, decrease in reds, great increase of eosinophiles. In December, six months after onset, he was sallow, emaciated, liver enlarged. Bowels constipated, stools contained fragments of mucus. Ova with living embryos found (0·055 mm. in small numbers); treated with Beta-naphthol. Total white count kept at a high level; eosinophiles, reaching 68 per cent., have now dropped to 38 per cent.; polynuclear cells increasing. Patient made a complete recovery.

Abstracts and Reprints.

THE SYMPTOM PAIN IN THE DIAGNOSIS OF APPENDICITIS.[1]

By Pellegrino A. D'Acierno, M.D.

(1) The symptom pain in the right iliac fossa, though found in the majority of cases, is not constant, being absent particularly in cases of chronic latent appendicitis, or appendicitis with referred symptoms (appendix dyspepsia of Moynihan), appendicitis juxtacecalis duplivelata, toxic appendicitis, and in cases of silent appendical abscesses giving metastases to other organs through the portal or the lymphatic system.

(2) When present, the local pain is changeable in regard to its position, character, and time of its appearance.

(3) As a rule in all acute cases the initial pains are of paroxysmal or cramp-like character, and referred to the epigastrium or to the mesogastric region, and almost always accompanied by nausea and vomiting, followed by pain, rigidity and tenderness in the right iliac fossa, a rise in temperature, and an increase in the number of leucocytes (Murphy).

(4) The subjective pain and tenderness in the right iliac fossa become evident as soon as the diffuse initial pain subsides.

(5) The epigastric or mid-abdominal pains in children generally overshadow the pain in the right lower quadrant, being rapidly followed by symptoms of general peritonitis, due to precocious rupture of the appendix. There are, however, a limited number of silent cases of appendicitis which either clear up by spontaneous drainage into the cæcum, or end by a slow process of gangrene and peri-appendicitis which form a localized walled off abscess.

(6) In chronic recurrent appendicitis the subjective pain, generally, is not referred to the right iliac fossa, but to the epigastric region, probably due to a reflex pyloric spasm.

(7) The mere pain in the right lower quadrant, not accompanied by the other chronopathological symptoms, is not sufficient evidence of existing appendicitis, but rather of reflex origin, as in lobar pneumonia, typhoid fever, cholelithiasis, &c., else the symptom of a calculus in the right ureter, or of oöphoritis, or oöphorosalpingitis.

(8) Any appendectomy based exclusively upon the symptom pain in the right lower quadrant may spell failure as far as the therapeutic result is concerned, whereas, when performed early, in conditions referred to, it accomplishes a cure in about 96⅛ per cent. of all cases and 99 1-7 per cent. in cases of localized appendicitis without peritoneal involvement (Lett, Deaver).

(9) Other abnormal or pathological conditions of the abdominal organs, as, for instance, a right floating kidney, movable cæcum, ileocæcal tuberculosis, adenitis of mesenteric glands, especially tuberculous, ileocæcal actinomycosis, acute suppurative periostitis of the inner surface of the ileum, tabetic crises, anginoid pains due to sclerosis of the superior mesenteric artery, and other conditions, should always be borne in mind when making a diagnosis of appendicitis.

(10) The occurrence of toxic appendicitis, as described by the French authors, is rare, and should be more properly classed as fulminating appendicitis.

On the other hand, there are a certain number of cases, characterized by transient tenderness and pain in the appendiceal region and by absence of other signs or symptoms of appendicitis, which occur sometimes in the course of some infectious diseases (acute rheumatism, tonsillitis, &c.), or mineral poisoning (saturnism), or primary anæmias (pernicious anæmia), or anaphylactic disturbances (urticaria, eczema, serum disease), and undoubtedly are due to toxic substances in the blood-stream which stimulate and irritate the nerves of the appendix without causing any clinical sequence in it. For this group we would suggest the term appendicodynia.

[1] Abstracted from the *New York Medical Journal*, June 7, 1922.

(11) The röntgenology of the appendix and the gastro-intestinal tract requires further development. The collaboration of the surgeon with the röntgenologist would enhance the accuracy of diagnosis.

(12) Appendicitis is as atypical as any other abdominal affection, therefore neither pain nor tenderness, nausea or vomiting, fever nor leucocytosis are to be considered as pathognomonic symptoms; but the discrimination of these fundamental symptoms and signs, and above all the comprehension of their development and interrelations are sufficient evidence to warrant a positive diagnosis of appendicitis and a timely intervention by the surgeon.

THE COMPLEMENT-FIXATION TEST FOR HYDATID DISEASE AND ITS CLINICAL VALUE.[1]

By N. Hamilton Faisley.

Ghedini (1907) applied the principles of the Bordet-Gengou method of serological diagnosis with three cases of hepatic hydatid. Weinberg (1909), Winsberg in Kolle, and Wassermann's system (1913) gives an account of serological reaction. Of 241 positive, eight were slightly positive and forty-seven were negative. In echinococcosis is a specific test dependent on an antibody in blood, and of patients absorbing hydatid antigen derived from cysts of *Tænia echinococcus*. For economy of material measured agents by Donald's pipettes. Antigen consists of hydatid fluid with scolices under sterile conditions.

Before use the fluid goes through a filter paper with filtrate employed as antigen. The antigen to use for good results is prepared with a saline or alcoholic extract. Pleural and peritoneal exudates to be treated. If cerebrospinal fluid is tested it should neither be heated nor diluted.

Table I.—Arrangements of reagents in final test controls employed. The final readings are made within thirty minutes. These positive types of reaction are diagnostic of echinococcal infestation.

Hydatid Antigens.—Fluids from lung or liver cysts of sheep proved satisfactory. Saline and alcoholic extracts of mother endocysts and of daughter and grandmother cysts are devoid of antigenic properties. Scolices yield high potent antigens.

Hydatid Antigens.—Hydatid fluid from human cysts do not constitute a satisfactory antigen, as from sheep, the fluid should not be filtrated nor an antiseptic. It was found that saline and alcoholic cysts are devoid of antigen properties. Twenty-one other patients did not manifest the clinical signs of the disease. Four of the patients were syphilitic.

Echinococcosis: Certain complications such as rupture of cyst.

Condition of cyst: Uncomplicated; recent rupture, or recent suppuration; chronic suppuration; old rupture; and degeneration of parasite.

Complement-fixation reaction: Eight other helminthic diseases such as bilharzia, &c.

Out of 774 cases negative serological results, reactions never met; non-hydatid sera hæmolyse rapidly.

Summary.

A satisfactory technique for the complement-fixation test for hydatid is described, its clinical value estimated in 153 observations of hydatid disease. The condition was diagnosed as pulmonary tuberculosis.

The value of X-rays—conclusions: Treatment satisfactory; X-rays of chest.

REFERENCES.

Allbutt and Rolleston, Osler and McCrae, D. A. Welsh and Carling.

[1] Abstracted from the *Medical Journal of Australia*, vol. i, No. 13, April, 1922.

THE INTERPRETATION OF THE WASSERMANN REACTION.[1]

The Wassermann test is based on a reaction known as complement-fixation reaction described by Bordet and Gengou (1906).

Bacteriolysis or hæmolysis to occur, antigen, amboceptor and complement must be present. For purposes of illustration: if sheep's cells (antigen), blood serum of rabbit immunized to these cells (amboceptor), and fresh normal blood (complement) hæmolysis will occur, the hæmoglobin will wash the red out. If the cells of fresh blood be added, nothing occurs unless serum is added, and hæmolysis results. Blood serum is not fixed, either by antigen or amboceptor, but only fixed when both antigen and amboceptor are combined. Bordet and Gengou discovered complement-fixation as a specific test for differentiation of bacteria. They found that by using a bacteriolytic and a hæmolytic system together it is possible to discover a specific antigen or amboceptor in a mixture. The hæmolytic system is an indicator as hæmolysis is visible to the naked eye, but bacteriolysis is not. From these experiments in bacteriolysis and hæmolysis complement-fixation can be used to a specific micro-organism. Wassermann, Neisser and Bruck applied it to syphilitic serum, and in 1906 published their results.

As generally used the Wassermann is not a true species reaction, but it can be made so by employing antigens from pure culture of spirochæta.

Factors influencing the Reaction.—A number of factors may be falsely positive or negative. (1) Contaminated sera with *Staphylococcus aureus*,

[1] Abstracted from the *Journ. Royal Naval Med. Serv.*, April, 1922.

albus, or *Bacillus subtillis* may give positive complement-fixation in normal serum, blood serum to be collected under aseptic cautions. (2) Blood serum containing bile will be false. (3) Alcohol even in days of prohibition should not be forgotten when blood is collected for the Wassermann; a negative reaction occurs after ingestion of alcohol for two days. (4) Shortly after general anæsthesia reactions have been obtained in sera which have proved normal.

SUMMARY.

(1) Wassermann reaction for all intents may be regarded as specific.

(2) Careful judgment to be exercised in the interpretation of results of the Wassermann.

(3) A negative reaction may occur in a syphilitic due to the normal daily variation in the complement-fixation power of syphilitic serum.

(4) Contaminated blood may give falsely positive reactions.

(5) Wassermann-fast cases mean a grave infection, visceral or nervous syphilis.

(6) Ingestion.

(7) Of alcohol previous to taking blood rendering reaction negative. A positive reaction with cholesterinized antigen only or with the ice-box method of fixation are of value only with a history of symptoms of syphilis.

(8) The ingestion of alcohol previous to blood will render reaction negative. A positive reaction obtained in normal sera shortly after general anæsthesia.

(9) Blood containing bile may give a positive reaction.

(10) A negative reaction in the newly-born for a period of four months is of no value.

(11) A single negative reaction means nothing.

(12) In a suspected case a series of eight consecutive daily tests should be done.

If these remarks are kept in mind of clinician when he seeks the result of a Wassermann there will be much less criticism of the value of the test, as well of the laboratory worker, and patients will benefit.

SUMMER DIARRHŒA IN INFANCY.[1]

By WILFRED J. PEARSON.

THE disease may set in suddenly, or may develop slowly with increasing diarrhœa. The history of the subsequent progress varies greatly, but, broadly speaking, can be epitomized as follows:—

(1) The acute symptoms disappear in a few days, and the child makes an uninterrupted recovery.

(2) The child shows no signs of rallying, the temperature continues high, the diarrhœa, prostration and nervous symptoms remain intense, and death occurs in two or three days.

(3) The diarrhœa becomes chronic, increases of food are never tolerated, and the child slowly sinks.

(4) The early acute symptoms subside somewhat, and the illness takes on the character of an ileocolitis, the recovery from which is slow and tedious. Relapses, with a return of all the acute symptoms, are common in all cases, and are mainly due to injudicious feeding.

The prognosis depends largely on the previous health of the child, on the environment, and whether or not prompt and efficient treatment is given. The cases in which there is definite improvement in the stools and general symptoms on withdrawal of food usually do well. When nervous symptoms are pronounced, or the breathing is of the toxic type, the outlook is serious; while of individual symptoms, persistent high temperature and decided inelasticity of the skin are of bad omen. Broncho-pneumonia is a fairly frequent and usually a fatal complication.

Treatment.—In treatment one is faced first with the problem of managing the *acute stage*. The main indications are to eliminate toxins by stopping all food; to evacuate the stomach and bowel; to combat collapse by restorative measures; to replace fluid loss; and to neutralize toxins by giving alkalies. In the *later stage* the chief concern will be to find a suitable diet.

(1) *Evacuation of Stomach and Bowel.*—This may be effected, first, by washing out the stomach with sodium bicarbonate solution (5i to a pint of water), and irrigating the colon with warm water or saline; secondly, by giving a dose of castor oil (1 to 2 dr.) or, alternatively, small doses of calomel (gr. 1/10 to 1/4 according to the age) every hour for six doses, followed by a dose of milk of magnesia. In severe cases, in which the diarrhœa is already profuse, purgation must be avoided; it will only do harm.

(2) *Restorative Measures.*—If the child is much collapsed, a mustard bath (one tablespoonful of mustard to one gallon of water at a temperature of 100° to 105° F.) is a valuable stimulant. Reddening of the skin under this treatment is a good prognostic sign. After the bath the child should be put to bed and kept warm in a well-ventilated room. If further stimulation is required, brandy (5 to 10 minims) well diluted should be given every one to two hours. If necessary, subcutaneous injections of strychnine (liq. hydrochlor. ½ to 1 minim) or of camphor in olive oil (¼ gr. to 5 minims) may be given. To replace excessive fluid loss, subcutaneous injections of normal saline are indicated; they should be given at a temperature of 105° F. (about), 3 to 6 oz. at a time at intervals of five to six hours. Saline may be given intravenously in very urgent cases. Intraperitoneal injections are not recommended, for they are not devoid of risk.

(3) *Diet.*—In the breast-fed a temporary withdrawal from the breast is advisable in most cases, water being given for twelve to twenty-four hours. When feeding is started again skimmed maternal

[1] Abstracted from the *Practitioner*, vol. cix, No. 1, July, 1922.

milk should be given; later, when a return is made to breast-feeding, only short feeds should be allowed at first, the time at the breast being gradually extended till full feeds are taken. Plenty of water must be given throughout, especially when the child is being underfed. *Artificially-fed.*—All food must be stopped for from twelve to twenty-four to forty-eight hours until the acute symptoms subside, boiled water, weak tea, or rice-water only being given. Thorough treatment at this stage is essential; half measures are worse than useless.

The next stage, the return to food, is a difficult one, and no definite rules can be laid down as regards the feeding, for each case must be treated on its own merits. Whatever kind of food is chosen, attention must be given to the following points: (1) To give small feeds at first; (2) to make additions slowly; (3) to note the effect of such increases on (*a*) the temperature, (*b*) the stools, (*c*) the general condition. Generally speaking, it is best to avoid milk until the temperature is nearly normal. In all cases, when feeding is recommenced, fat should be left out entirely at first. This leaves the option of a diet mainly protein or mainly carbohydrate.

If, in a case in which the stools are strongly acid, starvation causes a decided improvement and a fall in temperature, a protein diet is indicated. Boiled skimmed milk (peptonized or not) may be added cautiously to rice-water giving at first ¼ to ½ oz. every second feed, and gradually increasing if improvement is maintained. The next step, the stools now being formed, is to add sugar cautiously in small amounts to equal parts of skimmed milk and water. As an alternative, feeding with buttermilk is often successful. Finally, a half cream dried milk or ordinary milk and water mixture may be given. Whey is often well tolerated, and is an alternative method of treatment after starvation. It may be given plain or in the form of sherry whey. In many cases, however, it is not satisfactory, and is hardly to be recommended as a routine. If given, it may be slowly replaced by milk as before.

In other cases the persistence of the temperature and the continued frequency of the stools, which now contain flakes of mucus and streaks of blood, seem to suggest that an infective process has established itself. In such it is often better to give food containing little residue, and if skimmed or peptonized milk does not agree, greater success is often obtained with a malted food (Mellin's and water) or a malted milk.

In a child over six months who has definite signs of colitis, the best treatment is to give arrowroot water (one to two tablespoonfuls to one pint) or Benger's food at first, and, later, to add skimmed milk or buttermilk (without the fat) by degrees. Fat is badly tolerated in these cases, and should be ordered with caution.

It is perhaps unnecessary to add that breast-milk, if available, is in all cases the most suitable food.

(4) *Drugs.*—These play a relatively small part in the treatment. After the initial stages, when the diarrhœa is less but still persistent, small doses of ol. ricini may be valuable; it may be given as ol. ricini, 1 minim; mucil. acac., 15 minims; aqua menth. pip., ad 5i, every four or five hours. Bismuth, if given in large doses (5 to 20 gr. from a few weeks to a year old), may be of much value, especially in cases in which the large bowel is affected. Opium, too, is a useful drug, but requires to be used with discrimination. It is especially indicated when the stools are very frequent or there is severe pain. It is of the greatest service in the choleraic type. Generally speaking, it should not be prescribed in the early stages until the bowel has been emptied; if the cerebral symptoms are definite; if the motions are small and offensive. It can be given as tinct. campt. co. to a small infant, and as pulv. ipecac. co. (⅛ gr. at three months, ¼ gr. at six months) six-hourly at a later age.

(5) *Special Indications* (*a*) *Persistent Vomiting.*—In many cases vomiting ceases at once, if the feeds are reduced in size and only small quantities given at a time. In all cases a preliminary wash-out of the stomach is indicated. Sometimes it is necessary to stop giving even water by mouth, in which case saline must be given rectally or, failing this, subcutaneously. Bismuth and resorcin may do good in some cases, but, as a rule, drugs are of little value with the exception of morphia, which may be given hypodermically (1/100 gr. at three months) in urgent cases when the above methods have failed.

(*b*) *Acidosis.*—In most of the severe cases, and always when there are clinical evidences of this complication, sodium bicarbonate should be prescribed in large enough doses (10 to 20 gr.) to keep the urine alkaline. If not retained orally, it must be given rectally or intravenously (3 to 4 per cent. strength).

(*c*) *Hyperpyrexia.*—If the temperature is persistently high (105° F.) steps should be taken to reduce it. This can be done by sponging with tepid water or by applying a cool pack, wrung out, with water at a temperature of 80° F. This latter method is often helpful in controlling not only the hyperpyrexia, but also the nervous symptoms that so frequently accompany it.

(*d*) *Tenesmus.*—This is usually associated with stools containing much mucus, and is best treated by rectal irrigation with warm water combined, if need be, with doses of opium by mouth.

Original Communications.

THE LARYNGEAL COMPLICATIONS OF TROPICAL DISEASES.

By W. Salisbury Sharpe, M.D., M.R.C.P., F.R.C.S., D.P.H., D.T.M. & H.

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Leprosy.

Ulceration with erosion of the cartilages, and sometimes with the formation of granulomata, occur in leprosy, and these laryngeal complications are occasionally causes of death in this disease.

It is probably known to you that the initial lesion of leprosy is commonly, if not invariably, to be found in the nose. Indeed, a swelling of the nasal mucous membrane is the most characteristic manifestation first in evidence, and is often followed quite early by an ulcer on the septum. In the larynx the epiglottis is the commonest and earliest seat of leprosy. It becomes enlarged, displaced backward, narrowed, and often shows small nodules. The more or less uniform swelling gradually invades the interior, and may cause considerable obstruction in breathing before the voice is much altered, but eventually nodules invade the vocal cords and sub-glottic area. Stenosis may at this stage become very marked; in some cases, before this stage is reached, extensive ulceration takes place, and the resulting cicatrization produces a stenosis. In many cases the larynx participates in the condition of anæsthesia.

Glanders.

This disease is considered next after leprosy, because, like leprosy, the initial lesion is commonly found in the nose. It differs, of course, in the different bacillus found, and also in the fact that ulceration takes place earlier in glanders than in leprosy. It is, of course, well known that the bacillus of glanders is Gram-negative and not acid-fast, whereas the bacillus of leprosy is Gram-positive and acid-fast. Glanders in its chronic form attacks the larynx and extensively erodes the vocal cords and the cartilages. In this it differs from leprosy, which does not until the later stages produce extensive destruction of cartilages. Glanders causes stenosis by the œdema accompanying the ulcerative process.

Small-pox.

Laryngitis is a not uncommon complication of small-pox. It may be rapidly fatal by the production of œdema. It may be associated with a fibrinous exudate. It is liable to extend and to involve the cartilages, when it may proceed to the extent of producing necrosis. In the trachea also there may be ulcerated erosions. Variolous implication of the larynx has also the effect of diminishing its sensibility, and for this reason irritating particles sometimes reach the lower air-passages and set up bronchitis or broncho-pneumonia.

Enteric Fever.

This disease affects the larynx in three ways: by œdema of the glottis, by diphtheritis, and by ulceration. Œdema of the glottis has been noted to occur in about 1 per cent. of fatal cases. Diphtheritis must be defined as inflammation accompanied by membranous exudate, not due to the Klebs-Loeffler bacillus, but to other organisms, most commonly some form of streptococcus. Diphtheritis in a severe and extensive form occurs in about one case in between seven and eight hundred. Ulceration of the larynx occurs usually in the posterior wall, at the insertion of the cords, at the base of the epiglottis, and on the arytenoglottidean folds. The cartilages are very apt to be involved. Ulceration usually comes on in the larynx at the same time as the ulceration in the ileum. It may also occur in the later stages of the disease.

Hydrophobia.

In the earliest or premonitory stage the larynx is sometimes injected and the voice becomes husky. There may or may not at this stage be any difficulty at all in swallowing. In the second, or stage of excitement, violent spasms, usually reflex from some very slight cause, affect the muscles of the larynx and mouth. They are painful, and are accompanied by an intense sense of dyspnœa, even when the glottis is widely open or when tracheotomy has been performed. Attempts to swallow give rise to painful spasms of the muscles of the larynx and the elevators of the hyoid bone.

Syphilis.

The question of laryngeal syphilis is a very large one, and only the merest outline can therefore be given.

Inherited Syphilis.—Does not commonly affect the larynx; when it does, it takes the form either of perichondritis or of hyperplasia, with or without ulcerations and granulations. It may give rise to alteration of voice, stridor, or to grave and dangerous œdema. Laryngeal lesions in congenital syphilis do not readily yield to treatment; moreover, the Wassermann reaction may not give a definitely positive result.

Acquired Syphilis (*Secondary*).—Affection of the larynx is uncommon. It takes the form of a dusky congestion, or of mucous patches. It disappears rapidly under constitutional treatment.

Tertiary.—By far the greater proportion of laryngeal syphilis is of the tertiary type and occurs in the forms of gumma, ulceration, perichondritis, with or without necrosis, induration, scars and adhesions. It may occur relatively early in the tertiary stage, or quite late in life. Gummatous infiltration may be diffused or localized. Ulceration, when it occurs, is usually an after-effect of gumma. They may occur in practically every part

of the larynx, and need careful differentiation from the effects of tuberculosis, lupus, and malignant disease. The differential diagnosis is in some cases of great difficulty. In general it may be said that ulcers from syphilis are sharply defined. The edges often undermined, the surrounding area thickened, slightly raised and dusky; but in the active stage there is, as a rule, little or no fixation or impairment of movement. Impairment of movement and ultimately fixation are, however, common later results. The situation of the ulcers is so variable that it is difficult to give any rules. As compared with tubercle, syphilis is more apt to attack the edges of the vocal cords, and more apt to be bilateral, whereas tubercle affects more often the upper surface, and is frequently unilateral. The scarring, due to healed ulceration, may be very extensive, and may produce considerable deformity and stenosis. During the progress of the disease, general constitutional treatment is important and usually effective. But there is little scope for local measures. The after-results will need to be dealt with according to the effects which they produce. Pain is not usually a marked symptom, except when a gumma invades the epiglottis or is rapidly breaking down. Dysphagia is not very common, but is very marked in a small proportion of cases where the gumma involves the glosso-epiglottic structures. Dyspnœa may be produced by gumma, œdema, or cicatrization, or sometimes by perichondritis. It is to be noted that syphilitic disease of the larynx occurs sometimes in combination with tuberculosis, and is a not infrequent precursor of malignancy.

Tuberculosis.

Laryngeal tuberculosis is an even larger subject than laryngeal syphilis, and cannot be dealt with exhaustively within the limits of this article. It will be considered under two headings:—

(1) As a complication of pulmonary disease, and

(2) The local manifestations.

Involvement of the larynx in the course of pulmonary tuberculosis is a very common event. In some cases loss of voice or other laryngeal symptom is the first which calls attention to the presence of tuberculosis at all, and no evidence may at this time be discoverable in the lung. In the majority of such cases there is doubtless already co-existent disease of the lung, but this may be in so early a stage as to be as yet undiscoverable. It may actually be primary, though this is probably rare. The experience of the writer extends to a period as long as eleven years between an apparently primary laryngeal tuberculosis and the onset of further tubercular manifestation. In this case the later tuberculosis was that of a wrist-joint, and though the patient was lost to view about a year after, it is believed that general tuberculosis followed. In other cases the larynx may suffer as a terminal event in pulmonary tuberculosis, and it is to be noted that the onset of laryngeal symptoms in an advanced case of lung disease is of very bad augury.

That the last statement, although generally true, is liable to exceptions, is illustrated by another case which was under the writer's care some years ago. A lady who had been suffering from tuberculosis of the lungs for two or more years commenced to lose her voice, and examination of the larynx showed definite laryngeal involvement. At the time that this occurred she was an inmate of a sanatorium.

After examining the larynx and finding there definite evidence of tuberculosis, the medical superintendent told her that nothing in the world would now save her, and that as she would probably die within three months, it was useless for her to remain in the sanatorium. She had therefore been discharged. On examination the evidences of laryngeal disease did not appear of a very acute type. The lungs showed marked evidence of tubercular lesion, apparently not in an active, but in a static or healing condition. The patient was therefore placed in a nursing home and active local treatment of the larynx carried out, keeping a keen eye on the lungs, weight, &c., meanwhile. This patient is well and strong to-day (seventeen years later), and has up to now shown no signs of the further progress of tuberculosis, either in lungs, larynx, or elsewhere. She came successfully through an attack of pneumonia some three years ago without its being followed by any tubercular activity.

The Local Manifestations of Tuberculosis in the Larynx.

In the earliest stage a general anæmia of the epiglottis and larynx, sometimes also of the pharynx, not associated with signs of chlorosis or general anæmia is present. It is sometimes replaced by chronic hyperæmia, which may be generalized or present in limited patches, thickening in the inter-arytenoid region, thickening or congestion of one arytenoid or ary-epiglottic fold, or a rounded outline of one cord or swelling of one ventricular band. All these are points giving rise to suspicion of tuberculosis. Sometimes diminution of movement of one or other, or of both cords, may be seen; later a definite thickening of the inter-arytenoid tissue, smooth unilateral or bilateral infiltration over the arytenoids and of the ventricular bands are other early signs. Later, hyperæmia and a granular condition of the true cords and ulceration upon them become manifest. When ulceration once commences it spreads to any of the infiltrated regions. The epiglottis becomes ulcerated in a great proportion of all cases which survive until so late a manifestation takes place. It may be eroded until little of it is left, but more commonly, before this stage is reached, it becomes fixed and acutely painful, giving rise to the most distressing dysphagia, and by this means further deteriorating the already impaired nutrition, and so accelerating the fatal issue.

Perichondritis of the arytenoid is not uncommon; of the thyroid or the epiglottis it is rare. Large granulomata also are rare.

Gangosa.

Without entering into the question of the possible connection between gangosa and yaws, it is necessary to draw attention to the destructive ulcerative rhino-pharyngitis which in some cases extends until the larynx is reached and its cartilages extensively destroyed. Extension to the larynx is not a common occurrence, and the disease has never been known to commence there. Long before the larynx is involved, speech is seriously interfered with by destruction of both soft and hard palates. Œdema of the larynx and the inhalation of food particles are dangerous when the larynx is implicated. Treatment is the same as that of the disease before it reaches the larynx.

Anthrax.

The inhaled form of this disease affects the nasal and pharyngeal mucous membrane, tonsils and epiglottis. It also gives rise to general hyperæmia of the larynx; but since it is usually rapidly fatal by a specific type of penumonia, these local manifestations are masked and rendered of secondary importance by the extreme gravity of the pulmonary infection.

Leukæmia.

In cases of leukæmia, a peculiar yellowish pallor somewhat resembling that of early tuberculosis is sometimes seen in the pharynx and larynx. Small submucous hæmorrhages may occur. Lymphoid nodules and lymphomatous infiltrations of the mucous membranes with secondary necrosis and ulceration take place in the pharynx and larynx. The description was well given by Virchow many years ago. "Lymphoid nodules appear on the inner surface of the epiglottis, on the ary-epiglottic fold, and over the entire surface of the larynx and trachea, sometimes even in the bronchi, presenting usually a small, whitish, moderately raised and rounded swelling of rather soft consistency, frequently situated at the orifices of gland ducts, but also found in other situations." The nodules sometimes unite, forming fairly large tumours Paralysis of the recurrent laryngeal nerve has been known to occur from pressure or traction by such tumours. Diffuse infiltration has been known to lead to laryngeal stenosis. Hæmorrhages have occurred from the larynx, as well as from the nose and pharynx in this disease.

Gonorrhœa.

Occasionally gonorrhœal arthritis may be localized in the articulations of the larynx, crico-arytenoid and crico-thyroid, and may produce symptoms similar to those which occur in acute articular rheumatism. It occurs, of course, in connection with arthritis in other joints. The arthritis causes pain, aphonia and failure of adduction of the vocal cords. There may be localized acute tenderness in the laryngeal region. Some degree of difficulty in phonation, owing to sluggishness in the movement of the cord, is liable to remain for some length of time. A case has been recorded where the voice was lost in gonorrhœa and no arthritis could be made out. It was judged to be a case of neuritis.

Leeches.

Some of the water-leeches have been known to invade the larynx. Leeches are present in certain waters in most parts of the world, including this country; but as we do not here drink untreated water out of the ponds which they chiefly inhabit, they do not trouble us much. In some tropical countries they are present in most sources of water supply, and are particularly active about dusk, and are then apt to be swallowed in drinking water.

On reaching the mouth, pharynx, or larynx, probably on account of the incessant movement of the part, the leech keeps moving about and biting repeatedly in different places, so causing a great number of bleeding points from which much blood may be lost.

Continual short cough with the expectoration of small quantities of almost pure blood is the principal symptom; but if, as frequently happens, the leech fixes itself in the immediate vicinity of the vocal cords, distressing and dangerous interference with respiration may take place. Laryngoscopic examination will confirm the diagnosis.

Treatment.—A strong solution of cocaine (20 to 30 per cent.) should be applied in very small quantity on a pledget of wool to the head of the leech, and the patient then laid prone with the head hanging forward, so that the parasite may be coughed up when, paralysed by the cocaine, it becomes detached.

Trichinosis.

Two cases have been reported of laryngeal paralysis, a result of trichinosis. The left vocal cord was immovable midway between the positions of phonation and respiration, and there was, in addition, a paralysis of the constrictors of the pharynx.

Intestinal Parasites.

These give rise at times to reflex irritation of the nasal and laryngeal mucous membranes, causing tickling sensations and sometimes sneezing and short irritative cough. It is said that serious spasm of the glottis may be due to this cause; but this must, if it occurs at all, be very rare.

Erysipelas.

The larynx is affected by this disease in two different ways. First, by extension from a swelling and redness of the mucous membrane of the mouth and fauces; second, by extension of the inflammation from the surface of neck inwards. The latter form is that in which the severe œdema occurs which is sometimes seen.

Mycoses.

Actinomycosis occurs usually in the mouth and pharynx, and in rare cases exteuds to the larynx. The charaeteristic hard infiltration then extends lower down the neck than its usual submaxillary site. The larynx, pharynx, thyroid glands and the large vessels aud nerves will in such a case be embedded within the infiltrated tissue. Later, the usual softening and suppuration takes place. It has been known that infiltration has taken place within the larynx, but this is rare.

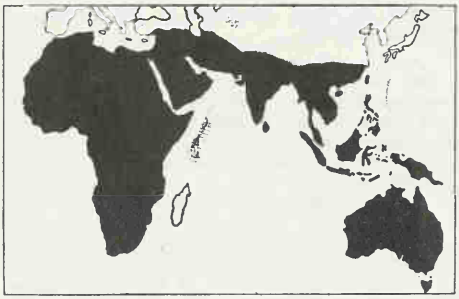
Foot-and-mouth Disease.

This disease has been transmitted from animals to man on several occasions, and though the lesions are usually found on the tongue, gums and palate and the pillars of the pharynx, they have also been seen on the free border of the epiglottis and over the right arytenoid eartilage. They consist of, first, blisters, which rupture and leave an ulcer, the floor of whieh is covered with white exudate, and the edges are raised, dark red and irregular.

LINGUATULIDS PARASITIC IN MONITORS. THE NEW GENUS *SAMBONIA*.

By Major Fernand Noc, M.D.,
French Colonial Troops,
and
George S. Giglioli, M.D.Pisa, D.T.M. & H.Lond.

The family *Varanidæ* consists of a single genus, *Varanus*, comprising about thirty species, widely distributed throughout the Ethiopian, Oriental, and



Map showing distribution of the family *Varanidæ*.

Australian regions, but absent from Madagascar, the greater part of the palearctic region, and the whole of the Western Hemisphere.

So far, tongueworms (*Linguatulidæ*) have been reported only from Afriean monitors. Lohrmanu found them in *Varanus niloticus* and Shipley in *V. ocellatus*.

Lohrmann's observation was published in 1889. Under the name of *Pentastomum clavatum*, he briefly described a new species of tongueworm collected from the lungs of the Egyptian Monitor (*V. niloticus*). The specimens were badly preserved, and this may account for his meagre description, which we here give in full, made into English: "Body of the adult female club-shaped, slightly flattened on the ventral surface; markedly incrassate anteriorly to the line of union between middle and anterior thirds, while gradually tapering towards the posterior extremity. Length, 13-17 mm. Maximum width, 3 mm. Hooks and mouth-ring small. Hooks disposed with short interval between. Found in the lungs of *Varanus niloticus*."

Iu 1898 Sir Arthur Shipley placed Lohrmann's linguatulid in the genus *Porocephalus* under the name of *Porocephalus clavatus*, and, after quoting Lohrmann's description and reproducing the latter's drawing, wrote: "Lohrmann's sketch is so slight that I have had a figure prepared from a specimen of what I take to be the same species which was found in the lungs of the Ocellated Monitor (*Varanus ocellatus*) and is now in my collcetion. This specimen showed about thirty-niue rings. The species resembles in appearance the *P. oxycephalus* of Diesing."

In 1910 Sambon pointed out that the specific name *clavatus* proposed by Lohrmann for the linguatulid of *V. niloticus* was preoccupied. It had been suggested by Jeffries Wyman, in 1845, for a linguatulid of *Boa constrictor* which Sambon had proved to be speeifically distinct from a numoer of forms (*Porocephalus crotali*, *P. stilesi*, *P. wardi* &c.), hitherto confounded under the name of *P. crotali* (*sensu latiore*). It is true that Sambon placed Lohrmann's species into a different genus (*Reighardia*), but, observing Art. 36 of the International Code of Zoological Nomenelature, which rules that "a rejected homonym can never again be used, even when the speeies is placed in another genus," he proposed to call it *Reighardia lohrmanni*.

Here a few words are neeessary with regard to the genus *Reighardia*. This genus was proposed by Professor Henry Ward in 1899 for the linguatulid discovered, in 1861, by the distinguished Italian zoologist, Professor Filippo de Filippi, in the air sacs of the Common Tern (*Sterna fluviatilis*), and again, in 1883, by Mégnin in those of the Glaucous Gull (*Larus glaucus*), but Ward did uot publish a diagnosis of his new genus. The name *Reighardia* was practically a *nomen nudum*. The only characters he mentioned: "body elongate, transparent and devoid of annulations; euticula thin; mouth surrounded by a chitinous framework recalling that of the Sarcoptidæ" are all common to other genera, and one of them—absence of annulations—erroneous, as pointed out by Sambon in 1910. The anatomy of *Reighardia* was investigated by Mégnin, but he came to incorrect eonelusions. Sambon took the trapezoidal disposition of the hooks, as shown in Mégnin's drawings, to be a charaeteristic feature of the genus, and without consideration of the

other striking differential characters, which, though erroneously interpreted, had been revealed by Mégnin's work, he ascribed to the genus *Reighardia* a number of species parasitic in crocodiles and fish (*Sebekia*, *Leiperia*).

While assisting Dr. Sambon in the preparation of his new classification of tongueworms, one of us had occasion to dissect two of Mégnin's original specimens, given to Dr. Sambon by Professor Blanchard. It so appeared that these Linguatulids differed greatly from those of crocodiles, and that the trapezoidal distribution of the hooks was not peculiar to the genus *Reighardia*. The gull's tongueworm like another linguatulid (*Raillietiella boulengeri*) which Dr. Sambon had previously found in a Puff Adder that died at the London Zoological Gardens, was characterized by a sac-like utero-vagina opening at the anterior extremity of the abdomen, but differed from it in many other particulars of generic value. In this connection, it is strange to find that while Ward's genus *Reighardia*, when founded merely on an obvious mistake—absence of annulation—was accepted, Sambon's genus *Raillietiella*, based on several new, striking and important characters, was practically ignored.

In his recent synopsis of the family (see this Journal, June 15, 1922), Sambon divided the Linguatulidæ into two subfamilies, one, *Raillietiellinæ*, characterized by a sacciform utero-vaginal opening at the anterior end of the abdomen, the other, *Porocephalinæ*, by a long, mueh coiled, tubular utero-vaginal opening more or less near the posterior extremity. He restricted the generic name *Reighardia* to the single type species *Reighardia sternæ*, found in the air sacs of Gulls and Terns (*Laridæ*), and distributed the other species previously (1910) included in the genus *Reighardia* into two new genera: *Sebekia* and *Leiperia*, forming the section *Sebekini* of the subfamily *Porocephalini*, to which one of us added a third genus: *Alofia*, characterized by an extraordinary muff-like development of the hook-glands which entirely surround the alimentary tube, closely imbedding it within.

In the present paper we propose to add a fourth new genus to the section *Sebekini*, for the linguatulid of the Nilotic Monitor which Dr. Sambon had tentatively and doubtfully included in his genus *Sebekia*, placing a point of interrogation after the generic name. Chief character of the genus *Sebekia* are the small, deeply serrated hooks (figs. 2-6), but neither Lohrmann nor Shipley had noticed any serrations on the hooks of the linguatulids they had examined.

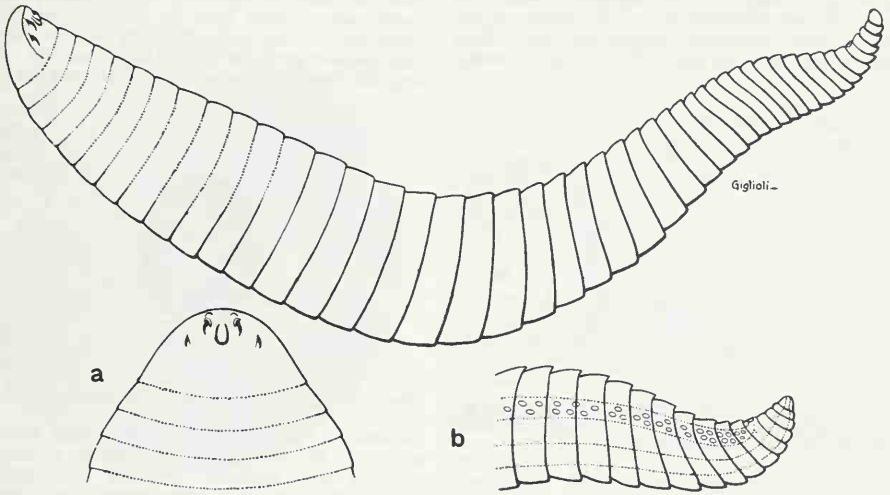


FIG. 1.—*Sambonia lohrmanni*. Adult female. (*a*) Cephalothorax. (*b*) Posterior extremity.

In 1920, at Dakar, Senegal, one of us found numerous tongueworms in the lungs of a Nilotic Monitor. The parasites were especially numerous in the left lung. Later, a microscopical examination of the lung (fig. 4) revealed numerous eggs of two kinds, some occupying the bronchioles, others scattered about the alveolar tissue. One kind, smaller, oval, contained a coiled-up nematode worm, the parental form of which—a filariid—were found in the pleural and peritoneal cavities; the other kind, larger, more rounded, covered with spines, enclosing an acariform embryo and contained in large, round vesicles, were undoubtedly the ova of the linguatulid, similar eggs being found in the latter's utero-vaginal coils. This observation was published in the *Rapport sur le Fonctionnement de l'Institut de Biologie de Dakar* for the year 1920.

Although known since 1889, this linguatulid has not yet been adequately described. All our specimens are females, and measure from 16 to 18 mm. in length and 2·5 to 3 mm. in maximum width. The annulations number about forty-four. The cephalothorax is small, acuminate, and continues the body without any sign of demarkation. The body is flattened anteriorly on its ventral aspect, convex on the dorsal side. The oral papilla is large and ovate; its chitinous frame extends from below the posterior hook-line to the anterior hook-line. It belongs to the type which characterizes the genus *Sebekia*, but is larger and more massive at the base. The hooks are simple, equal, smooth, and disposed in trapezoidal formation with posterior hook-line, much longer than the anterior one, thus forming a low and broad trapezoid with greatly inclined sides. The whole hook apparatus (hook and root) is comparatively small. In the specimens examined by us the blades of the anterior pair protruded considerably more than those of the posterior pair. The blades are sharp,

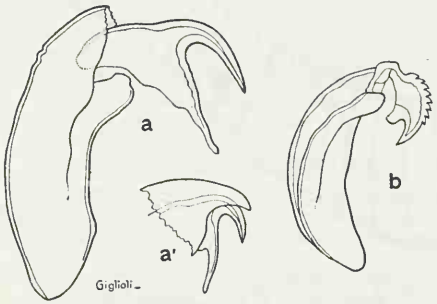


FIG. 2.—(*a*) Hook of *Sambonia lohrmanni*. The sheath-like process protecting the hook is broken. (*a*¹) Same with sheath complete. (*b*) Hook of *Sebekia Wedli*.

long, slender and caniculated, with strong and smooth base. When retracted they are practically ensheathed by a chitinous laminar process projecting from the root. This ensheathing apparatus is best seen in mounted specimens. The papillæ are hardly visible; even the two more prominent ones above the anterior hooks, usually so conspicuous, are scarcely marked.

The body is always more or less incurved. Its maximum width is about the junction of the anterior third with the middle one. The anterior half is fairly cylindroid, the posterior half tapers gradually towards the caudal extremity, which is markedly attenuate. The annulation is, as a rule, almost entirely effaced in the anterior two-thirds, owing to distension due to the expanding of the uterine coils, but it is clearly visible in the posterior third, especially on the ventral surface. Here the annulation is practically imbricate, each ring widening towards its distal end, and slightly overlapping the following narrower and shorter one. The last segment is small and pointed; it bears the terminal anus. The female genital pore does not open on the terminal segment, as is the case in the great majority of *Porocephalinæ*, but on the fifth body ring counting from the posterior end.

By examining clarified specimens, some of the anatomical features may be roughly made out. Thus one notices that the utero-vagina is tubular and much convoluted. Its development takes place principally within the anterior two-thirds of the body. The posterior third contains only the last tract which runs in a straight line to the genital pore and part of the intestine which appears to be straight and cylindrical. The spermathecæ also can be perceived at the anterior end, near the ventral side, placed in a line, one behind the other.

The ova are highly characteristic. Indeed, they can be readily recognized at a glance, not only from those of other linguatulids, but from any other known eggs. Taken from the distal portion of the utero-vagina, with embryo already well developed, they measure on an average 78 by 65 microns. The large bladder-like envelope is not visible in the eggs

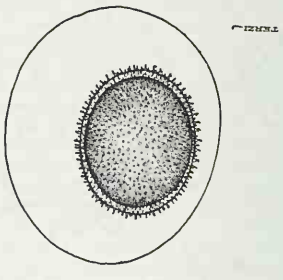


FIG. 3.—Egg of *Sambonia lohrmanni*, showing spinous shell.

so obtained, but is quite evident in eggs normally extruded, probably because this outer albuminous covering only becomes distended and apparent through the absorption of moisture. It is seen to perfection in the ova occupying the alveoli and bronchioles in our preparation from an infested monitor's lung (fig. 4).

The chitinous shell of the egg is thicker than usual, and is beset with minute spines which give it a singular burr-like appearance. The longer spines measure 3·5 microns and appear to be slightly clubbed and branched. These spines are seen only on mature eggs. Undeveloped ova taken from the upper portion of the utero-vagina have perfectly smooth shells devoid of spines like those of other species. The spines begin to appear when segmentation is fairly advanced, and they are at first very slender, straight and simple.

The external morphological and internal anatomical characters given in the above description are, we believe, sufficient to establish definitely and satisfactorily the taxonomic position of the monitor's linguatulid. The tubular utero-vagina,

long and much convoluted, at once places it in the subfamily *Porocephalinæ*; its cylindroid body, its small, acuminate cephalothorax with hooks arranged in trapezoidal formation, indicate that it belongs to the section *Sebekini* of Sambon's classification. The imbricative annuli, the hooks provided with chitinized guards, the position of the female genital opening on the fifth body ring, and the spined eggs show that it belongs neither to any of the three genera (*Sebekia*, *Alofia* and *Leiperia*) now constituting the section *Sebekini*, nor to any other known genera of *Linguatulidæ*. It is therefore the representative of a new genus of the *Sebekini*, for which we propose the name *Sambonia*, dedicating it to Dr. Louis Sambon, the distinguished scientist, who has so greatly contributed to our knowledge of this wonderful group of parasites attacking reptiles, amphibians, fish, birds, mammals and man.

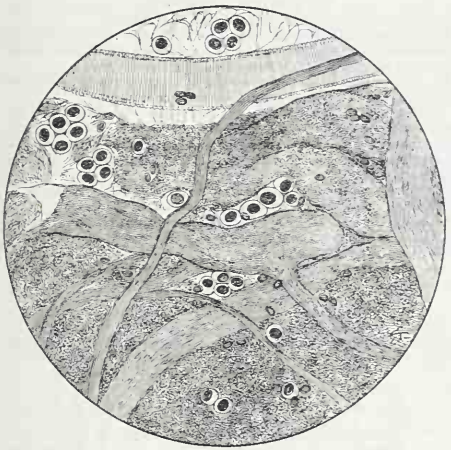


FIG. 4.—Lung of *Varanus niloticus* containing eggs of *Sambonia lohrmanni* and *Filaria macrofallos* in the alveolar tissue.

The species under consideration, inhabiting the lungs of the Egyptian Monitor (*Varanus niloticus*) and first discovered by Lohrmann in 1889, must, therefore, again change its generic appellation, but retain the specific name given it by Sambon in 1910, and be known henceforth as *Sambonia lohrmanni*.

Whether the linguatulid found by Shipley in *Varanus exanthematicus ocellatus* be identical with the one inhabiting *V. niloticus* cannot be determined without carefully comparing specimens from both hosts. However, taking into consideration that both *V. niloticus* and *V. exanthematicus* inhabit the same regions and have similar habits, and judging also from analogous examples such as that of *Armillifer armillatus*, a linguatulid found in *Python regius* and *P. sebæ*, both specifically distinct African Boids with overlapping distributional areas, their identity seems likely.

Three species of *Varanus* are known to occur in Africa. One of these, the Land Monitor (*V. griseus*), is a Palæarctic species with Mesopotamia as its centre of distribution. In Africa it ranges throughout Barbary and the lower Nile Valley. The second species, *V. niloticus*, is widely distributed over the whole of Africa except Barbary, and the third species, *V. exanthematicus*, is likewise widely distributed throughout Africa, but presents three distinct, though intergrading, varieties, each one of which has its own particular habitat. Thus *V. exanthematicus exanthematicus* extends throughout the Sudan from the headwaters of the Uele to the Senegal, *V. exanthematicus albigularis* ranges over the whole of South and East Africa, and *V. exanthematicus ocellatus* is essentially Abyssinian. Excepting *V. griseus*, which has peculiar habits, all other African monitors exhibit the same wide range of habitat and food. They hunt their prey in rivers and lakes, in open country and deep forest, on hills, and along the shores of water bodies; they have been surprised while nimbly following birds, mammals and reptiles high up on the tree-tops. Examination of their stomach contents has revealed a carnivorous diet of the most heterogeneous nature: small mussels and water-crabs, fish, lizards, frogs, the eggs and the young of crocodiles, birds and small mammals; their voraciousness has no bounds. Under the circumstances it would be difficult even to surmise by what means they become infected; in other words, in what intermediary host the tongueworms of the Varanidæ spend their larval and nymphal stages.

The great merit of the new classification is that it follows the natural system, and a proof of its soundness is that, though the various subfamilies, sections, genera and species have been based solely on morphological and anatomical characters, they show a remarkable zoological distribution or host correlation hitherto unsuspected. Different structural types strictly correspond to different host groups. Thus the genus *Reighardia* is peculiar to lariform birds, the genus *Linguatula* to mammals, the genera *Sebekia*, *Leiperia* and *Subtriquetra* to Crocodilia, the genera *Armillifer*, *Porocephalus*, *Kiricephalus* and *Waddycephalus* to snakes; the genus *Alofia* is in all probability confined to fishes, and, no doubt, our new genus *Sambonia* is peculiar to lizards.[1] This host specialization is carried down to the very species, thus *Porocephalus crotali* is peculiar to snakes of the genus *Crotalus*, *P. stilesi* to snakes of the genus *Lachesis*, and *P. clavatus* to Boids. The genus *Raillietiella* shows a somewhat wider range in its hosts, being found in amphibians and reptiles.

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The Signs of Filarial Disease (B. Blacklock, *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 2, July, 1922).—Two hundred and forty cases were examined at Mabang, Protectorate of Sierra Leone, in July-August, 1921, with a view to establishing a correlation between "signs of filarial disease" and the occurrence of *Microfilaria bancrofti* in the blood.

The figures obtained do not show the same kind of correlation in the respects as do Stephens' figures, obtained by analysing Manson-Bahr's Fiji cases.

The figures obtained show that in this series many of the "signs of filarial disease" have no more correlation with the presence of microfilaria in the blood than has hernia; some have less.

Studies in Bacterial Variability. The Experimental Production of a Mucoid Form of Bacillus paratyphosus B (E. Ainley Walker, *Journal of* Hygiene, vol. xxi, No. 1, June, 1922).—The experimental derivation of a mucoid form of *Bacillus paratyphosus* B is described.

This form, though at one stage non-motile, agreed closely with the "capsulated mucoid forms" of paratyphoid B, isolated by W. Fletcher from two chronic "carrier" cases.

The mucoid paratyphoid B was highly dys-agglutinable, and it would not on serological examination be identified as a paratyphoid B.

Its colonies were also entirely unlike colonies of paratyphoid B, being large, slimy and usually dome-shaped, though at other stages of their metamorphosis they presented either an umbilication or a nipple-like elevation in the centre.

The mucoid bacillus possessed the distinctive sugar-reactions of paratyphoid B.

On suitable manipulation it reverted to the ordinary form.

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THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 1, 1922.

THE MEETING OF THE BRITISH MEDICAL ASSOCIATION.

GLASGOW, JULY, 1922.

TROPICAL medicine as a separate section at the British Medical Association in either 1921 or 1922 found no place. Neither at Newcastle nor at Glasgow was the subject as such admitted to the group of sections. The reasons assigned are said to

be that at neither place, amongst those who had the direction of the affairs of the Association, was the subject found to be an appropriate one for discussion. Even at the great seaport of Glasgow, from which centre ships sail every sea, tropical medicine found no local exponent to take up the subject. Newcastle, again, is a port not unknown in tropical regions, but at neither of these seaports could a place be found for the discussion of diseases which may afflict the sailors and travellers on every ship which leaves our shores or reaches the ports in all the seven seas. Much might be said on the subject, but the pursuit of the theme would but lead to acrimonious discussion. The effect of this omission will become apparent by-and-bye, and the legend, What do they know of England who only England know? might be paraphrased as What do they know of disease who only local diseases know?

How different with the Germans. They have this summer just held a meeting of their tropical diseases experts, and the usual papers on tropical diseases have been read and discussed. What a parody the whole thing is! The British doctors have passed over the subject for two whole years, whilst the Germans are dealing with diseases which, except in an academic sense, are of no direct consequence to them as they have no colonies nor tropical possessions. Of course there is attached to this a condition which is, as regards diplomacy, surely a burlesque of so superlative a quality that even their own master of absurdities, the Baron Munchausen, has to hide his head. If the papers say truly the German doctors have discovered a cure for sleeping sickness, which is so sure to succeed that they are willing to exchange it with the Allies for the return of their colonies. If it is true that the offer has been made, it is a perfectly safe bargain for the Allies to make. German contributions and advances in tropical medicine are few and far between, and this sudden disclosure of a remedy with the conditions attached makes even the keenest believer in German practical medicine hesitate.

We are all believers in the German investigators; we consider that until a new discovery has been through the German mill, and been thoroughly tested therein, it cannot be registered as an accomplished fact in science. Germany thereby performs a great and lasting good and occupies a unique place of the highest position in the scientific world. As discoverers they have not, at least they have not taken, a predominant place in tropical medicine as original discoverers; it is not in their province. Can it be that deep-thinking Germany has fallen to this, that their great men of science have been cajoled into bargaining land for the saving of human life?

Britain and France have led the way in tropical medicine; there is no gainsaying this fact, for the lead has been of no ephemeral nature. This statement of the discovery of a cure being German will be apt to be believed as superlative to British work *because* it is German. We are so accustomed to regard every discovery made by a Brtiish observer as of less consequence than that made by a German that the public at home are apt to be led away thereby. Many means of treatment of sleeping sickness have been devised with successful results to a point and been used for sleeping sickness. The cause of the disease has been settled by men from this country—Castellani, Bruce and others, only to mention a few; and the spread of the disease has been controlled by the several medical men in Uganda, Mongalla and other parts who have been guarding the heart of Africa against this scourge. After all the disease, although deadly, is not of that wide distribution which would raise it to a position by the *uncertainty* of its success to be worth the former German colonies of the world.

The first subject dealt with at the gathering was *alcohol*—its effect on body and mind and on national well-being and the opposite; in fact, on all that concerns its use and misuse in health and sickness. In the discussions we were supplied with much that was fresh, we cannot say new; many statements were mere platitudes, and some were personal opinions founded on more or less scientific investigations. In no single instance was the "*quality*" of the alcohol dealt with; whether it was the "fine old Highland whisky made in Germany," as the label with a Highland soldier in full costume testified, but really made in Haiphong from rice, and supplied to the soldiers and sailors in Hong-Kong public-houses kept by Levantines, and sold at 30 cents per case of twelve bottles in imperial pints, or the finest champagne brandy; whether beer made by the "clever German chemist" from material with which hops and barley have nothing to do, or "hock" from German chemical laboratories made in Hamburg, and that "had never seen the grape."

Before descanting on the effects of alcohol, one would like to know the quality of the whisky, brandy, wine or beer used in the physiological experiments. No chemist can tell by testing the "quality" of any alcoholic beverage. The doctor speaks of "sound wine" for his patient's use, of "wholesome beer," &c., without any means of judging whether it is sound or wholesome. So with beef, no chemist by analysis alone can tell whether beef is the "best British" or derived from the continental ox that has been pulling a plough for ten years before being sent to the London market.

There is no Commandment amongst all the ten that forbids the consumption of alcohol. In the days these laws were written they used the juice of the grape as their beverage. "New" wine was not put into old bottles (skins), no more should the new manufactures of "clever" German chemists be put into human skins. Will it do any good to add to the above that this subject of pure and wholesome alcohol, both as drugs and beverages, should be studied more closely? Given wholesome spirits and wines, whatever that may exactly mean, is it too much to say that half the evils ascribed to spirits and wines are due to the part laboratories

in recent years have played in the production of our various drinks?

These unwholesome liquors will, perhaps, produce a condition of things cherished and hoped for by many, that intoxicating drinks will disappear from off the earth. Many men have given up beer owing to its quality. It is some twenty years ago that so-called "good old English beer" largely disappeared from our cellars, whether in our homes or our public houses. A friend who had been long in the colonies told the writer that one thing he and others with him looked forward to on reaching British shores was that they would get a good draught of English beer, mentioning the brand. One of the first things he did was to go to a public house and get draught beer. After a few mouthfuls he spat it out and rounded on the landlord. He tried a second, and even a third house, and had no better report to make.

They felt that England had lost one of its attractions during the years they had been abroad. That the "home-brewed" had lost its flavour, its body and its charm, and for ever afterwards they foreswore beer. When claret was tried, they declared it was "red ink" that had been given in mistake, and that so many of the brandies were a liquid of fiery abomination. "Rather than drink more, I'll become a teetotaler altogether." The vile spirit had done a good deed; it had done the good action by its badness; it was a better missionary of temperance than all the oratory of all the cranks ever could do. As the formation of alcohol in the economy when starch is converted into sugar and sugar converted into alcohol and carbonic acid gas, a process which ceases only when the body has completely satisfied its wants as regards alcohol by the presence and action of the self-produced alcohol, so the depth of unsavoury liquid having been reached checked the continuance of his imbibition and made of him a "dry" man. It had inhibited further action—that is, "drinking." The evil had wrought its own cure. Wine for sacraments in churches has, especially amongst the Jews, given rise to some anxiety at times. The juice of the grape is alone officially permissible. For Northern and Western Europe amongst Christian churches Spanish wines are most frequently exhibited, and the wine is most frequently blended so as to be tempered in strength. During the war, when wines were scarce and expensive and apt to be something else than the product of grapes, the Jews, ever careful of the elements of sacrament, at times resorted to raisins, and from these an infusion, a decoction, or liquid extract was made and used. This preparation is used in sparsely populated places where distance still remains a difficulty.

On inquiry amongst wine merchants, the writer would seem to have found the solution of obtaining purity in our spirits at all events. Whisky made from malted barley is taken charge of by the Government through the officers of the Excise, who are responsible for the care of the whisky for three years. It is said to be placed in bond, and until that period has expired the casks (old sherry casks usually) are taken out of bond and handed over to the customers. So far the whisky is pure and most of the dangerous ingredients negatived. But the blender—that is, the middle man between the distiller and the ordinary consumer at restaurants and the licensed victualler houses—takes the whiskies, and by mixing them pretends to improve their flavour, their bouquet, &c. This is, as a rule, a pretence; it is merely an opportunity to replace good spirit with other whiskies from abroad or inferior Spanish brandy, to colour, add an aroma to, but really to cheapen the whiskies they sell. The pure spirit after three years is thrown upon the market, and the usual blender, one may be sure, blends the expensive spirit with cheaper spirits, and thereby obtains a larger profit. The only way the wine merchants recommend to thwart his knavery is to bottle the spirit before it is allowed to go out of bond and prevent the seals being broken until the bottles are in the hands of the customer. This will at least prevent blending by any except the customers themselves or those who can afford to buy bottles of whisky, but in the public houses customers, who get it supplied by the glass only, cannot be sure of what they get, for once uncorked the channel for adulteration is opened. Stop the distilling of whisky altogether, and a large part of the people in northern climates are deprived of their beverage; for the kind of drink consumed is a question of latitude. In northern countries, say as far south as 60°, whisky is the beverage used. Further south beer is largely consumed, and still further south, red and white wines are drunk by the people in freely diluted quantities. Medicinally, these spirits and wines have each their uses and their idiosyncrasies.

One of our leading wine and spirit merchants in London "agreed that the only real test for adulterated spirits is taste and experience in the trade.

"The whole trouble with present-day bad whiskies," he said, "is blending. With pure malt whisky at 28s. to 30s. a gallon, California spirits at 2s. 9d., and Spanish brandy at 7s. 6d. a gallon, the temptation to blend them with whisky is apt to overcome unscrupulous dealers.

"As the law stands to-day it is impossible to prevent this. You cannot clear grain or malt whisky in bond under three years, but once it is cleared it disappears into space as far as the authorities are concerned. And you do what you like with it.

"Nobody is any the wiser if this whisky is subsequently blended with cheap Spanish brandy. There is no analytical test to prove it. The only remedy would be to compel bottling to take place in bond."

During one of the late revisals of the "Pharmacopœia" the "Brandy and Egg mixture," which under its Latin name of "Mist. Vini Gallici" had hitherto appeared therein, was omitted, and

there is now no *officinal* spirituous mixture in that bulky volume.

The editor of the "Pharmacopœia" being on holiday lamented the circumstance, and looked upon it as a loss to our equipment in medicine.

This adulteration of alcohol, be it by blending, by chemical and laboratory-made wines and spirits, or in whatever way it is brought to the market in Britain, will do more than "Pussyfoot" to check the use of alcohol and alcoholic beverages, and the distillers, brewers and wine merchants have only themselves to blame if they find that the consumption of alcohol disappears and that they are the cause of Britain ceasing to be a "wet" country.

J. C.

TELEGRAM RECEIVED FROM INDIA.

WEEK ENDING AUGUST 12, 1922.

Maritime Towns.

Cholera:

	Deaths
Calcutta	3
Bombay	2
Rangoon	4
	9

Plague:

Bombay	6
Rangoon	37
	43

Influenza:

Calcutta	16
Bombay	4
Rangoon	9
	29

Small-pox:

Calcutta	2
Madras	82
Rangoon	6
	90

Provinces.

Plague.—Spreading in the Poona district of the Bombay Presidency, the Madura and Coimbatore districts of Madras, and the Yamethin district of Burma; *reinfected* Moulmein town, the Insein, Pegu, Amherst and Kyaukse districts of Burma and the Southern Shan State.

Cholera.—Spreading in the Dharwar district of the Bombay Presidency, the Guntur, Kurnool and Anantapur districts of Madras, the Bankura, Midnapore, Parganas, Nadia and Bogra districts of Bengal, the Champaran and Cuttack districts of Bihar and Orissa and the Myingyan district of Burma; *reinfected* Bassein town and the Henzada and Sagaing districts of Burma; *freshly infected* the Sholanpur district of the Bombay Presidency and the Nellore, Chingleput, Madura, Cuddapah and Malabar districts of Madras.

Small-pox.—Spreading in the Godavari, Chingleput, South Arcot, Trichinopoly, Tanjore, Ramnad, Tinnevelly, Cuddapah and Salem districts of Madras, the Jalpaiguri district of Bengal and the Gujranwala district of the Punjab; *reinfected* Akyab town and the Maubin district of Burma.

Influenza.—Unimportant.

Relapsing Fever.—Three deaths in the Nasik district of the Bombay Presidency.

Annotations.

The Digestive Properties of Philippine Papain (Harvey Brill and Robert Brown, *The Philippine Journal of Science*, vol. xx, No. 2, February, 1922).—Autolysis of papain takes place at temperatures as low as 0° C. when the enzyme is put in water solution with toluene as an antiseptic. Air-dried samples in sealed glass containers had lost their activity at the end of seven years. Sodium chloride shows first a slightly activating effect, followed by an inhibiting effect in more concentrated solutions. Sodium carbonate, sodium bicarbonate, calcium chloride, magnesium sulphate, and boric acid have no marked influence; potassium chloride and sodium citrate showed marked influence; while acetic acid and lactic acid, contrary to the findings of Vines and of Mendel and Blood with hydrocyanic, a weak organic acid, showed strong inhibiting effects.

Dental Efficiency in the Navy (D. H. C. Given, *Journal of the Royal Naval Medical Service*, April, 1922).—Surgeon Commander D. H. C. Given: "Neither medicine nor dentistry can hope to obtain the goal implied in what we term preventive medicine without the aid of the other." "The higher the civilization the higher the percentage of caries." Examining 575 officers and men: Is your digestion good? Has it always been? Are your bowels always regular? Is it a fact that aliens from various parts of Europe to this country with sound teeth very soon suffer from dental disease? Dental efficiency among Chinese outside Treaty ports is on a higher plane than among white races. In New Zealand the problem of dental disease is as urgent as in this country. The basis of method is (*a*) molar efficiency, (*b*) general efficiency.

Molar Efficiency.—Group (1) represents very efficient opposing molars without gaps. Group (2), good opposing molars, not necessarily complete. (3) Opposing molars both sides, several missing, sometimes only represented by wisdoms. (4) Opposing molars on one side only. (5) No opposing molars. The cross classification based on general efficiency as follows: (*a*) represents soun teeth; (*b*) minor defects requiring treatment; (*c*)

gross deficiencies and defects (either or both). It is intended that both (*a*) and (*b*) should be considered together, and it has to be borne in mind that sound (*a*), defective (*b*), and deficient and defective (*c*) occur in varying proportions in all the five groups representing molar efficiency. Artificial teeth are more and more prevalent in the Service. Officers' teeth in those over 35 years were inefficient; natural efficiency unaided by the art of dentistry was rare among officers as compared with the men. Officers' teeth are more liable to caries. A dental officer from New Zealand asks: Are not the best users of the best toothbrushes our best paying patients? The belief that the days of the toothbrush are numbered is gaining increased support. Thorough mastication of a wholesome natural diet is sufficient for the maintenance of sound teeth.

The author concludes that it might be inferred that dental hygiene has little significance for the Navy, because disease is already established. If we originate a thorough campaign based on study of nature and biology, sooner or later we shall elucidate some of Nature's secrets. The American Navy is equipped with a well-appointed dental surgery in their ships.

A Critique of the supposed Rodent Origin of Human Giardiasis (Charles E. Simon, *American Journal of Hygiene*, vol. ii, No. 4, July, 1922).—On the basis of morphological, biochemical and experimental studies, it is believed to have been established that specific differences exist between the human giardia and the mouse form, as was first suggested by Bensen, and subsequently by Kofoid and Christiansen, and that similar differences also exist between the human form and the meadow mouse form and between the latter and the mouse form, as was first suggested by Kofoid and Christiansen, though in both instances on what is regarded as insufficient evidence.

It seems warrantable to assign species' names to three forms, and that of *muris* is accepted for the mouse form, as suggested by Bensen, and the name *mieroti* for the meadow mouse form, as suggested by Kofoid and Christiansen. For the human form it is believed that Stiles, as set forth above, is justified in rejecting Kofoid's term *enterica*, and that according to the rules of nomenclature the organism should henceforth be known as *Giardia lamblia*.

Culture rats and wild rats cannot be infected with *G. lamblia*, while they may readily be infected with *G. muris*.

Culture rats, wild rats, and wild mice cannot be infected with *G. microti*.

There is no basis for the assumption that the human infection is referable to either rats, mice, or meadow mice.

It is believed that the human infection is of human origin.

A Few Observations on Malaria in Infancy (W. A. Mulherin and F. X. Mulherin, *Journal of the American Medical Association*, vol. lxxviii, No. 24, June, 1922).—Malaria presents a different clinical picture in infancy and up to 3 years of age than seen in adults. The younger the patient the more decided is the difference.

Periodicity in subjective and objective symptoms is more frequently absent than present. Fever is oftener remittent, irregularly intermittent or absent than regularly intermittent.

Enlargement of the spleen is absent in fully 30 per cent. of cases of malaria in infancy. Sterilization with standard treatment of more than 90 per cent. of malaria cases is believed to be questionable.

Ultrascientific treatment of malaria, "no malaria parasites found in the blood, no quinine to be given," is wrong in principle and in practice.

The Spread of Bacterial Infection. Some Characteristics of the Pre-epidemic Phase (W. W. C. Topley, *Journal of Hygiene*, vol. xxi, No. 1, June, 1922).—The author comes to the following conclusions:—

(1) During the pre-epidemic stage of the spread of bacterial infection among mice, single deaths, or small groups of deaths, due to the specific infection being studied, are found to occur at considerable intervals before the rise of the main epidemic wave, and to afford a warning that such a wave is at hand.

(2) In many cases there may be observed, during the same period, an increase in the daily mortality from all causes.

The Spread of Bacterial Infection. The Effect of Dispersal during the Pre-epidemic Stage and of Re-aggregation (W. W. C. Topley, *Journal of Hygiene*, vol. xxi, No. 1, June, 1922).—The author comes to the following conclusions:—

(1) If a mouse-population, which has been exposed to risk of infection, be dispersed into several small groups during the pre-epidemic stage, the total mortality will be far less than if the animals be retained as a single large group. The specific mortality will be reduced to a still greater extent.

(2) During the period of dispersal, the mice forming the small groups will, in most cases, have passed through an extended pre-epidemic phase of the spread of infection. In so doing they will have acquired an appreciable dogree of immunity.

(3) If the small groups be later re-combined into a single aggregate, further deaths will occur; but the total mortality among a group of mice, which has been dispersed and then re-accumulated, will always be less than among a similar group, which has been retained from the commencement as a single unit of population. The specific mortality will generally show a still greater reduction.

Chaulmoogra Oil in the Treatment of Tuberculous Laryngitis (Frank L. Alloway, S.B., M.D., and James E. Lebensohn, M.S., M.D.Chicago,

Journal of the American Medical Association, vol. lxxix, No. 6, August 5, 1922).—The authors come to the following conclusions:—

Chaulmoogra oil should have a definite place in the treatment of laryngeal tuberculosis. It is useful in the majority of cases, though in the treatment of laryngeal tubereulosis as a whole it cannot entirely replace the other forms of medication, such as the cocaine-epinephrin spray, orthoform, menthol and Lake's pigment, superior laryngeal nerve blocking, epiglottidectomy, &c.

Some may be sceptical of the value of chaulmoogra oil, as employed in these cases, because the mechanism of its action is not clear. It may be true that the oil has no specific effect, but its beneficial action can be perhaps adequately explained by its detergent, anæsthetic and counter-irritant properties. Barwell says: "Intratracheal-oil injection act in the same way (i.e., like steam inhalations and oil nebulæ) in relieving dryness and soreness of the throat, and I have found them very useful in cases of advanced ulceration, reducing inflammation and relieving discomfort." He employed a 1 per cent. solution of menthol in liquid petrolatum, but from both theoretical considerations and clinical experience it would appear that chaulmoogra oil should act more efficaciously.

The Chaulmoogra Oil Treatment of Tuberculous Laryngitis (Robert A. Peers, M.D., and Sidney J. Shipman, M.D., Colfax, Calif., *Journal of the American Medical Association*, vol. lxxix, No. 6, August 5, 1922).—The authors come to the following conclusions:—

(1) Intralaryngeal applications of a 10 to 20 per cent. solution of chaulmoogra oil in olive oil may relieve the dysphagia of an advanced laryngeal lesion entirely, but such relief has followed its use in only one out of seven cases. Slight temporary relief occurred in every case.

(2) On the other hand, the general condition of a febrile patient may, possibly, be unfavourably influenced by such treatment.

(3) Caution should be used in the laryngeal treatment of tubereulosis with chaulmoogra oil until more accurate data are in our possession concerning its local and general effects.

The Correlation between the Chemical Composition of Anthelmintics and their Therapeutic Values in connection with the Hookworm. Extract of Male Fern (Rev. Father J. F. Caius, S.J., M.S.C.I.Paris, and Dr. K. S. Mhaskar, M.D., M.A., B.Sc., D.P.H., D.T.M. and H., *Indian Journal of Medical Research*, vol. ix, No. 2, October, 1921.)—The following results are recorded by the authors:—

(1) In a series of fifty-one cases treated, thirty-eight hookworms were removed out of a total of 1,285. The worms expelled were dead, but retained their natural shape.

(2) No ascarids were removed, though roundworms were present in fourteen cases and whipworms in eight.

(3) No tapeworms were passed, though six cases were infected with them.

(4) Extract of male fern is a mixture in which the several constituents are present in varying proportions. It deteriorates readily and may easily be adulterated.

(5) Very little is known of the chemistry and pharmacology of the drug.

(6) 90 minims is the admissible dose.

(7) Extract of male fern cannot be recommended as an anthelmintic.

The Correlation between the Chemical Composition of Anthelmintics and their Therapeutic Values in connection with the Hookworm Inquiry in Madras Presidency (Father J. F. Caius, S.J., M.S.C.I. Paris, and Dr. K. S. Mhaskar, M.D., M.A., B.Sc., D.P.H., D.T.M. and H., *Indian Journal of Medical Research*, vol. ix, No. 2, October, 1921).—The authors have investigated the anthelmintic properties of kousso and recorded the following results:—

(1) One case who had received 3½ dr. of the drug passed thirty-three hookworms out of a total of thirty-eight. The removal went on for three consecutive days, on which 16, 11, and 6 worms were expelled respectively.

(2) In a series of twelve cases treated with doses varying from 2 to 5½ dr., only two hookworms were removed out of a total of eighty-six.

(3) Neither roundworms nor whipworms were removed, though seven cases were found infected with the former and two with the latter.

Kousso cannot, therefore, be recommended as an anthelmintic.

The Correlation between the Chemical Composition of Anthelmintics and their Therapeutic Values in connection with the Hookworm. Pulvis Arecæ. (Father J. F. Caius, S.J., M.S.C.I.Paris, and Dr. K. S. Mhaskar, M.D., *Indian Journal of Medical Research*, vol. ix, No. 2, October, 1921).—In a series of ten cases no hookworm was removed, though subsequent treatments showed the presence of 232 necators and nine ankylostomes.

Two cases were found infected with roundworms and two with whipworms, but no worm was expelled by the areca nut treatment.

Pulvis arecæ cannot, therefore, be recommended as an anthelmintic.

The Correlation between the Chemical Composition of Anthelmintics and their Therapeutic Values in connection with the Hookworm Inquiry in the Madras Presidency (J. F. Caius and K. S. Mhaskar, *Indian Journal of Medical Research*, vol. ix, No. 1, July, 1921).—The authors came to the following conclusions:—

(1) Betanaphthol is a solid drug of constant chemical composition, not deteriorating with age, and easily obtained in the pure state. Its dosage is thus easy and certain.

(2) Betanaphthol is a powerful vermicide, acting both on ankylostomes and necators. Up to a dosage of 40 gr. the advantage lies with a single portion treatment; beyond 40 gr., with 50 and 60-gr. dosages, the drug may indifferently be given in one, two, or three portions.

(3) In sufficiently large doses betanaphthol is an effective ascaricide.

(4) Up to 60-gr. dosage betanaphthol is a very safe drug.

(5) Betanaphthol has marked vermifugal properties, and no afterpurge is required in the treatment.

Value of Quinine Prophylaxis (H. W. Acton, *Indian Journal of Medical Research*, April, 1921).—The author is in favour of the value of quinine prophylaxis in malarial fevers. It should be commenced when the minimum wet bulb temperature is approximately between 18° and 22° C., and ended when the temperature is lower than the optimum flagellation temperature. The doses, consisting of 10 to 15 gr., should be given continuously—that is, every day, or at the most every other day.

Rôle of Meteorology in Malaria (C. A. Gill, *Indian Journal of Medical Research*, April, 1921). The author attaches great importance to the influence of meteorology in the occurrence of malaria. It has been shown that meteorological factors, through their influence on the malarial parasite and its insect host, exercise an important effect on the transmission of infection, and consequently on the incidence of the disease. It is therefore concluded that the science of meteorology which fulfils such important functions in connection with many human activities may justly claim recognition as an important ancillary to medical science.

Unusual Relapse in Typhoid Fever (W. H. Higgins, *Virginia Medical Monthly*, September, 1921).—The author describes the case of a patient who in August, 1917, was given three injections of typhoid vaccine; his first attack of typhoid had occurred in 1901 and had lasted four weeks. In January, 1921, he developed typhoid infection, his blood culture was positive for typhoid bacilli, and a typical fever developed, during which time rose spots appeared, and there were the usual clinical symptoms of an average typhoid fever without complications. After two weeks of convalescence the patient returned to work and remained well until March, when he caught a chill, followed by a temperature of 103° F. Widal reaction and blood cultures were negative; leucocytes numbered 7,000, with normal differential count. There were no subjective symptoms apart from slight headache, and the fever lasted for twelve days, during which period successive crops of rose spots appeared on the abdomen and the spleen became palpable. A diagnosis was made of true relapse after forty-three days.

THE ESPECIAL SUSCEPTIBILITY TO LEPROSY IN THE FIRST TWO DECADES OF LIFE.

Sir Leonard Rogers, F.R.S., writing in the *Practitioner*, August, 1921, directs attention to "the especial susceptibility to leprosy in the first two decades of life." He states: I have recently drawn attention to a point in the epidemiology of leprosy, which is of interest from its analogy to tuberculosis, namely, the especial susceptibility to infection during the first two decades of life. From figures recorded by McCoy for the Malakoi settlement of the Sandwich Islands, I estimated that 65 per cent. of the infections occurred during the first two decades of life, while Atar, in Brazil, found the majority of lepers admitted to the Para hospice from 1900 to 1918 were under 20, and a very large majority under 30 years of age. Demy, in his study of 10,000 cases of leprosy in the Philippines, showed the probable source of infection in 73 per cent. of positive histories was between brothers and sisters, cousins, or children from their parents, all most likely to occur before adult life is reached, while in only from 1 to 2 per cent. was it between husband and wife, while McCoy, in the Sandwich Islands, found the latter figure to be 2·6 per cent., indicating a much less susceptibility in later than in early life. Again, Lie, in Norway, among 481 marriages of lepers, found infection in 10·27 per cent. of the children of leper fathers, 16·39 in those of leper mothers, and no less than 39·19 when both parents were lepers; and McCoy has shown that the fecundity of leper mothers is not decreased. Again, Demy showed that no less than 44 per cent. of children who lived with leper parents for seven to ten years contracted the disease, which is in great contrast to the relatively low incidence among married adults, while numerous records show that if children are separated from their leper parents at an early age they nearly invariably remain free from the disease. I, therefore, regard the prevention of the exposure of children and young adults to contact with lepers as one of the most important measures for controlling the disease.

The great frequency and importance of infection during childhood with tuberculosis is firmly established, and a recent paper by Armand-Delille on the work of the Grancher Institute of Paris for the protection of childhood from tuberculosis, by permanently removing children out of tuberculous families living in confined quarters, clearly demon-

strates the value of this measure. Thus, the incidence of active tuberculosis among children left in the care of their infected relatives was more than 60 per cent., quite apart from latent disease becoming active in later life, while among 2,200 children rescued from similar exposure to infection from tuberculosis by the Paris Grancher Institute during nearly eighteen years, only seven cases had occurred, two fatal meningitis, and five recovering ones, the incidence being thus only 0·35 per cent., and the mortality 0·1 per cent. In tuberculosis, then, as well as in leprosy, the prevention of susceptible children from living in crowded houses with infected adults is one of the most important measures for lessening the incidence of these two closely similar diseases, and it is to be hoped that before long this essential fact will be brought sufficiently home to the public to allow of the necessary compulsory powers being obtained to enable it to be more generally applied, for in few diseases is prevention so much easier and better than cure than in leprosy and tuberculosis.

Abstracts and Reprints.

A METHOD OF CONCENTRATION OF PARASITIC EGGS IN FÆCES.[1]

By W. H. Gates.

A large quantity of material is first strained through a sieve, or if only a small quantity is used this is not necessary, the fæces are then centrifuged first with water to wash off surplus lighter material, and then with sodium chloride to remove the bulk of the material and float the eggs practically free from sediment. The top 1 or 2 c.c. are removed with a pipette drawing chiefly from the rim of the meniscus, and centrifuged again with water, which sends the eggs to the bottom. The sediment is agitated vigorously, which stirs up nearly all the eggs which may have stuck to the bottom, and is then poured into a small dish. The centrifuge tube is rinsed out by water which is also poured into the dish. The eggs settle rapidly, and are loosened from the bottom by forcing a little water round the edge to produce a slight whorl. The dish is again agitated, gradually diminishing the motion, and it will be found that most of the eggs have settled within a very small field. The eggs may be examined in this condition, but for a closer examination it is better to draw up with a pipette a small quantity of water from the centre of the mass of eggs; hold this vertical and steady and the eggs will settle, so that a single drop forced out on a slide will contain nearly all the eggs drawn up by the pipette. If still further concentration is required, the eggs should be allowed to settle on the slide, and then remove a drop of water with blotting paper or lens paper and add another drop. If repeated with care a large mass of eggs may thus be collected.

[1] Abstracted from the *Journal of Parasitology*, vol. vii, No. 1, September, 1920.

CHANGES IN FINGER-NAILS AFTER RHEUMATIC FEVER AND TUBERCULOSIS.[1]

By William H. Rosenau.

Small circumscript depressions (pocking, stippling) occur in the nails following acute rheumatic fever and chorea in approximately 95 per cent. of the cases, particularly when heart complications are present. These changes are temporary and may disappear, to reappear after a recurrence of the same disease or some other infectious disease. One may see these changes as late as fifteen years after the last attack of rheumatic fever. These changes do not appear, as a rule, before six weeks have elapsed after the patient is taken ill, and often appear at a later date. The earliest time of their appearance is five weeks. These depressions are not infrequently associated with horizontal furrows, most often incomplete, and are not uncommonly seen together with lengthwise furrows, complete and incomplete.

The nails of all patients with heart disease (endocarditis, &c.) should be examined for these changes. It is felt that these changes occurring in the absence of active tuberculous disease and with an associated heart lesion are confirmatory, though not definite evidence, that the patient has passed through an attack of acute rheumatic fever or chorea, and that a heart lesion, if present, is probably rheumatic in origin. Several cases of valvular disease of undetermined ætiology have shown these changes.

These changes also occur in active tuberculosis in 70 per cent. of the cases, but they are often associated with transverse and longitudinal grooves and clubbing of the finger-nails.

The depressions have been found in 4·5 per cent. of control cases in which no definite ætiology could be ascertained, and they have also been found occasionally after a variety of diseases, such as scarlet fever, small-pox, empyema, typhoid and Hodgkin's disease.

[1] Abstracted from the *Journal of the American Medical Association*, vol. lxxviii, No. 23, June, 1922.

PROPRIETARY FOODS AND MILKS.[2]

By Edmund Cautley.

Although unnecessary for normal infants, the various proprietary or "patent" foods and condensed milks are useful in many states of ill-health and under certain conditions of existence. During hot weather and while travelling, when fresh milk

[2] Abstracted from the *Practitioner*, vol. cix, No 1, July, 1922.

is unobtainable, it is generally advisable, often imperative, to use condensed or dried milk in some form. Many wasted infants have been restored to normal health and strength by the judicious use of some one or other of these foods when they have failed to improve on milk in an ordinary or modified form.

The ability to use these foods successfully, and with a certain degree of scientific precision, depends on a knowledge of their characters and composition. In general, it may be stated, they are made from simple articles of diet, more or less modified in the process of preparation. The relative percentages of the essential constituents are sometimes all reduced, or one or more of them is increased or decreased.

Startling generalizations about their value must be avoided and condemned. It is grossly misleading to say that condensed milk has been responsible for more infantile deaths than the Great War. It is equally foolish to believe the exaggerated claims made on behalf of some well-advertised foods.

A good many varieties are referred to, though only a small proportion of those on the market. For practical purposes it is sufficient to possess an accurate knowledge of a few specimens of each type rather than burden the mind with a wide acquaintance with many specimens of the same general character. The credit attached to certain foods mentioned in this article is the result of personal experience, but it does not mean that other foods of similar type are not equal or, possibly, of greater value.

It must never be forgotten that all these foods are more or less altered in the process of preparation. They are no longer fresh foods, but are cooked foods, partly or entirely devitalized. They are deficient in certain inherent qualities of fresh food, notably enzymes and vitamines. It is essential to add an anti-scorbutic vitamine, such as the juice of oranges, lemons, cabbage, or swede turnips to the diet of an infant brought up on condensed milk or proprietary food. Scurvy in infants is now comparatively rare, because of the adoption of this precaution.

The value of fat-soluble A, the so-called anti-rachitic vitamine, is still *sub judice*. Protagonists of the hypothesi that rickets is due to lack of this vitamine, or that it is caused by lack of exercise and good hygiene in its widest sense, are maintaining their views with vigour, acrimony, and more or less convincing experiments. Nevertheless, no harm results from the addition of fat to the diet of an infant brought up on food lacking this constituent if the babe is in normal health. Animal fats, such as butter, dripping and cod-liver oil are more beneficial than vegetable oils. Cream often disagrees, perhaps on account of the large size of the fat globules or the addition of some preservative.

It is also important to realize that infants have been brought up successfully on a diet absolutely irrational from a physiological and scientific standpoint. For instance, a strong and healthy baby, six months old, was said by the mother to have been fed from the time of birth on oatmeal and water, with an occasional taste of other foods in the later months. Undoubtedly the adaptability of the human race is very great, and the child's stomach can be trained in the digestion of almost any food if it is given gradually and in small quantities at a time. The mere success of any food in a particular babe is no proof that such is the ideal food for infants. But if the child is progressing favourably on any diet it should not be put abruptly on totally different food, except, perhaps, in the case of acute illness, such as infective diarrhœa. All changes should be made gradually.

Further, many foods are altered by the mechanical processes of preparation and the degree of heat employed. Dried milk powders generally have a yellowish tinge, and contain no curdable casein; the casein has been ground up into a fine powder and the fat envelopes are broken, so that the fat runs together in the form of oil. Sometimes the food is digested by artificial processes before concentration, or is partly digested during its preparation. In other instances it possesses no inherent nutritive value, e.g., certain meat extracts, and is more a stimulant than a food, though it may be of great value by encouraging the appetite and the secretion of gastric juices.

Dried milk differs from condensed milk in that it is evaporated to dryness, and is supplied in the form of a powder containing very little moisture. Condensed milk is evaporated down to about one-third of its bulk. They are grouped separately. Condensed milk made from skimmed milk should not be used for infants in any circumstances, except during illness and under medical advice, because of its deficiency in fat. Bernard Dyer analysed seventeen such varieties, and found that in twelve the fat-content was under 1 per cent.

With a sufficient knowledge of the composition of the ordinary simple everyday foods, and the methods of their preparation and modification, it will be very clearly realized that these manufactured articles are by no means essential for the rearing of normal infants. Nevertheless, they are often extremely useful, for they are already prepared and easily obtained, more especially in case of illness or the failure of ordinary methods of feeding. In addition, the general public has a remarkable faith in some of these foods, and their psychical value must not be forgotten.

Original Communications.

THE GEOGRAPHICAL DISTRIBUTION OF HUMAN SCHISTOSOMIASIS.

By Frank Milton.

Human schistosomiasis is distributed around the world between 38° N. and 36° S. in a broad belt, which shows patches of peculiar intensity of infestation and other patches of still more curious freedom from all infection.

In Europe the only two known endemic centres are one in Cyprus and the other in Southern Portugal, and in both these centres *Schistosomum hæmatobium* is the only species found.

Sporadic cases have been reported in England at Norwich, at Borden, and in Kent, in persons who have never been out of England, all three cases being infested with *S. hæmatobium*.

In France, a case is reported of a man born in Cochin China in 1890, lived in France until 1909, when he returned to Cochin China for eighteen months' military service, returned to France in 1911, was mobilized in 1914 for service in France, and passed bloody urine with many terminal-spined eggs in 1915. Cochin China is not known to be infested with schistosomiasis, and in any case four years had elapsed between the time when the patient returned to France and the time when he first showed symptoms of infection.

A second case developed symptoms of intestinal schistosomiasis after twenty months' campaigning in France, and during treatment for a bubo in hospital at Toulon, where he had been four months before intestinal symptoms developed. This would seem to be a probable indigenous case, except for the fact that the patient was a Martiniquan, and the island from whence he came is a hotbed of *S. mansoni*.

The Continent of Africa is pre-eminently the home of the schistosomes, and there is hardly a part of it in which medical work is carried on with efficiency from which cases have not been reported.

Curiously enough, I have been able to find no record of any cases originating in Algeria, though Neveu Lemaire makes a general statement that the disease exists in that country.

The same is true of Tripoli and of the Red Sea coast. Lemaire makes the statement that the disease exists there, and that is all.

Of Abyssinia and of Italian Somaliland we unfortunately know nothing.

The most heavily infected countries in Africa would seem to be Egypt and the Egyptian Soudan, Cape Colony, Natal, and practically all British South Africa, British Central Africa, the districts around Lake Chad, Victoria Nyanza and Nyassa, Portuguese East Africa, British East Africa, and Zanzibar.

Both *S. hæmatobium* and *S. mansoni* are found in Africa, as are also cases of *S. bovis*.

The distribution of the species is interesting. *S. hæmatobium* and *S. mansoni* occur together in the coastal regions of Africa, with *S. hæmatobium* everywhere the predominant species. In Egypt the superiority, in point of view of frequency of occurrence, is overwhelming; in Morocco the proportion of *S. hæmatobium* to *S. mansoni* is reported to be as 16 to 1; in the military zone of French Guinea as 10 to 1; in Natal as 44 to 1; at Mombasa as 20 to 1. On the other hand, in the interior, as in the Congo Free State, *S. mansoni* is the only species found.

It is noteworthy that in the last two years *S. mansoni* appears to have begun to gain a footing in S. Africa; up till then the only cases of this form of the disease recorded in the sub-continent had been found among the labourers in the Rand mines imported from Central Africa; but Annie Porter found snails naturally infected with *S. mansoni* in Natal in January, 1920. Faust, in September of the same year, reported the presence of *Cercariæ mansoni* in *Physopsis africana* sent to him from Natal, and finally, in June, 1921, Cawston reported a boy from Sydenham with lateral-spined ova in his urine.

Countries and places in Africa known to be infected may be enumerated as follows:—

Egypt: Heavily infected throughout. *S. hæmatobium* extremely common; *S. mansoni* more rare.

Egyptian Soudan: Along both Blue and White Niles, Dongola, Bahr-el-Ghazal, El Obeid, Kordofan, Darfur, *S. hæmatobium* appears to be the principal, if not the only, species occurring.

Tripoli: Said to be infected.

Tunis, Sfax, Gabes, El Guetta, Djeride, Tozeur, Kebili, &c.: *S. hæmatobium* extremely common; *S. mansoni* rare.

Algeria: Said to be infected.

Morocco: Casablanca infected with *S. hæmatobium*, with some cases of *S. mansoni*.

French Soudan: Timbuctoo, Banaki, Bakel, Kourrousa, Dakar, with *S. hæmatobium;* some cases of *S. mansoni* at Karrousa.

Senegal: *S. hæmatobium* very common; *S. mansoni* not met with.

French Guinea: Both *S. hæmatobium* and *S. mansoni*.

Sierra Leone: Kissy, Mendi, Kounch, *S. hæmatobium* only described.

(Irvine in 1916 reported four cases of rectal bilharziosis as the result of the examination of 986 specimens of fæces in Sierra Leone. "The natives came from four different tribes, and are probably the first recorded cases of *S. mansoni* in the Colony.")

Liberia: Freetown, *S. mansoni*.

Gold Coast: *S. hæmatobium* only species noted.

Dahomey: Haut Casamance, *S. hæmatobium*.

Lagos: Both rectal and vesical cases.

Nigeria: Lokoya, Katagum, Ibi, Zungeru in Northern Nigeria, Bornu, and the whole of the Western Province, *S. hæmatobium* the only form recorded.

Cameroons: Doula, *S. hæmatobium*.

French Congo: *S. hæmatobium*.

Cabinda: Said to be infected.

Angola, Benguella: *S. hæmatobium.*

German West Africa (late): Uranga River, *S. hæmatobium;* Mossamedes said to be infected.

Cape Colony: *S. hæmatobium* widely distributed.

Natal: *S. hæmatobium* widely distributed; a few cases of *S. mansoni* and *S. bovis* in man.

Transvaal: *S. hæmatobium* common.

Orange River Colony: *S. hæmatobium* widely distributed.

Mashonaland: Both *S. hæmatobium* and *S. mansoni.*

Zululand: *S. hæmatobium.*

Basutoland and Damaraland are reported to be free from infection.

Rhodesia: *S. hæmatobium.*

East Coast, from Egypt to the Cape infected, principally with *S hæmatobium.*

Portuguese East Africa: Pungwe River, Angones, Makalanga, Quilimane, Mozambique, and whole country south of Zambesi, *S. hæmatobium* only species reported.

British East Africa: 83 per cent. of all patients in Mombasa Hospital infected, 5 per cent. of them with *S. mansoni.*

German East Africa (late): Ugogo, Tabora, Itigi, principally *S. hæmatobium;* some *S. mansoni.*

Zanzibar: Probably one-third of all male natives iufected with *S. hæmatobium.*

Central Africa: Whole district east and south-east of Lake Chad deeply infested, *S. hæmatobium* to *S. mansoni* as 20 to 1. Shari River, Fort Achambaud, Ain Timmian, Ubanghi, *S. hæmatobium;* *S. mansoni* relatively common on Upper Ouelle in the Zanda country. French Congo infected with rectal schistosomiasis with terminal-spined eggs. Congo Free State, *S. mansoni* frequent; *S. hæmatobium* absent. West Central Africa, *S. hæmatobium* common; *S. mansoni* occasional. Victoria Nyanza, at Nassa on south shore of Speke Bay, 50 per cent. of all persons examined had *S. hæmatobium.* On northern part of Lake, *S. mansoni* seems the more frequent form. 15 per cent. of patients examined in the Civil Hospital and gaol at Kisumu (north-east of Lake in British East Africa) had *S. mansoni* eggs in their fæces.

British Central Africa: *S. hæmatobium* common in all districts. Lake Nyassa: "Of parasitic diseases *S. hæmatobium* must take pre-eminence," nearly 50 per cent. of the males being infected in some of the Lake villages. *S. mansoni* is believed to be common round Blantyre and in the Shire Highlands. Cases of *S. mansoni* were met with by Stanmus at Zomba on Lake Chilwa. Uganda: *S. hæmatobium* common, also cases of pure rectal infection with terminal-spined eggs (? *S. bovis*).

Not only is Africa heavily infected with both *S. hæmatobium* and *S. mansoni,* as indicated above, but human infection with *S. bovis* is known to occur.

This has been definitely proved in S. Africa, and I think it may be suspected elsewhere.

S. bovis inhabits the hæmorrhoidal veins in bovines and equines, and its eggs are extruded via the intestine, but in some cases ova are passed via the bladder also, and Montgomery has described definite lesions in the bladder of bovines caused by this parasite.

In S. Africa Cawston has identified the ova of *S. bovis* in the urine of a Natal native who was also suffering from *S. hæmatobium.*

The ova of *S. hæmatobium* and *S. bovis* are very similar in appearance and both possess a terminal spine, and although the general outline is different and the ova of *S. bovis* are both longer and narrower than those of *S. hæmatobium,* it is still quite possible to confuse the former with the latter in a cursory examination, especially if the possibility of infection by *S. bovis* were not actually present in the mind of the observer.

It is known that the eggs of *S. hæmatobium,* usually passed in the urine, may occasionally be found in the fæces, and that those of *S. mansoni,* normally passed in the fæces, occasionally appear in the urine; but, as far as I know, no cases of pronounced hæmaturia or of any other vesical symptoms have ever been recorded in districts or countries where *S. mansoni* is the sole species present, and it is probable that serious involvement of the bladder never follows infection by *S. mansoni.*

Can the same be said of the rectum and *S. hæmatobium? Prima facie,* it should be probable that any involvement of the bowel in cases of pure *S. hæmatobium* would be slight, though I am by no means satisfied that this is so. It has never been definitely laid down whether the severe involvement of the bowel so frequent in Egypt is due to pure infection by *S. hæmatobium,* or to infection by *S. mansoni,* or to a mixed infection, though personally I always took it to be a matter of course that the infection in these cases was one by *S. hæmatobium.*

However this may be, the idea is general that *S. hæmatobii* is characteristically a vesical affection, and *S. mansoni* equally characteristically an intestinal affection.

In face of this it strikes one as odd that O'Connor, in writing of his experiences with the Egyptian labourers attached to the E.F. in the Sinai Peninsula, should have had to emphasize the fact that "clinically the most severe dysenteric cases due to schistosomes were associated with the presence of *S. hæmatobium*" and not with *S. mansoni.*

Low in 1907, speaking of his experience in Uganda, makes the further curious statement that in that country "the infection was almost entirely a rectal one; he never saw a bladder case while he was there, and it was most noticeable that all the cases showed terminal-spined eggs."

Lagrange describes the case of a girl coming from the Bangala country in the Belgian Congo with terminal-spined ova in her stools, causing acute dysentery, and with nothing in her urine.

Clapier found that 10 per cent. of the inhabitants

of Irebou, a village in French Congo, at the outflow of Lake Tumba, had *S. hæmatobium* eggs in their fæces without any in their urine, "nor was any case of vesical infection discovered in the village."

Clapier is led to wonder whether he has come across a new species of schistosomes, but I consider it more likely that both his cases and those of Low in Uganda were infections with *S. bovis*, and I think it is also possible that some of the more severe cases of "dysentery" with terminal-spined eggs seen in Egypt may also be due to this same parasite.

Madagascar is fairly heavily infected. An examination of 394 persons free from any symptoms yielded 12·9 per cent. infected with *S. mansoni*. The Southern Provinces seem to be the most heavily infected, and *S. mansoni* the only species present.

Mauritius: Vesical and vaginal lesions due to bilharzia are very common, and *S. hæmatobium* the only species recognized.

Asia: Palestine would appear to be infected in places, all cases recorded being due to *S. hæmatobium*. Mesopotamia is heavily and widely infested with *S. hæmatobium*. Persia is also infested with the same species.

In India the disease has not yet been recognized as indigenous. Hatch in 1887 referred to twelve cases in Bombay, "where the disease appears to be more common than formerly, especially amongst Mussulmans who have made a pilgrimage to Mecca." (This incidentally indicates the Hedjaz as being infected, though we have no other record.) His cases were therefore probably all imported. Ferguson in 1913 stated that "the disease exists on the west coast of India," but I cannot find his authority for saying so, and inquiries on the west coast reveal no evidence of the presence of the disease. Cases which would appear to have arisen in the country have been recorded in six British soldiers who have never been out of England before coming to India, and who developed the disease whilst in this country, and, curiously enough, three of these cases seem to have developed their disease in Poona between the years 1904 and 1906, and two in Mian Mir in 1903 and 1904. In the sixth case recently reported by Harkness, the possible locality of infection is not indicated. Besides these we have a case recorded by Hooton of a Parsee girl at Rajkot (Bombay Presidency), and one by Powell of a native of Bombay who had never been out of that Presidency. I think there is no doubt from the above that shortly after the Boer War, India, as far as Poona and Mian Mir are concerned, was infected with *S. hæmatobium*, but as far as can be ascertained the infection has now died out.

Since writing the above, Captain Sydney Smith has recorded, in the *Journal of the R.A.M.C.* for April, 1922, a sporadic case of Schistosomiasis hæmatobii occurring at Bolarum in the Hyderabad State in a British soldier who came to India, apparently direct to Secunderabad, the Military Station on the outskirts of which the village of Bolarum is situated, in 1920, and who had previously never been out of England.

The history of this case points very clearly to infection in August-September, 1920, from one of two pools near Bolarum.

It is to be noted that in 1918 a number of Imperial Service troopers infected with schistosomiasis, contracted whilst on service in Egypt, were under treatment in the Hyslop War Hospital at Bolarum, and although a search for infected snails in the tanks at Bolarum made by Annandale and Kemp in 1919 failed to reveal any infestation by *S. hæmatobium*, there can be no doubt that infected molluscs might have been found there in 1920, and Bolarum was (? is) an infected centre in India.

A cercaria closely resembling the recognized human-infecting forms has been found by Sewell in Calcutta and in the Wynaad plateau in Southern India. It is quite possible that this is indeed the cercaria of a human-infecting schistosome, but neither the mature form nor the definitive host has yet been found.

In Burma sporadic cases appear to have occurred at Thayetmyo and at Swebo, both *S. hæmatobium*, but the disease does not appear to be endemic in the country.

In China, the provinces of Chekiang, Hunan, Hopeh, Anwhei, Kiangsi and Changsa are all known to be infested, some of them extremely heavily. The only species met with is *S. japonicum*.

In Japan, the disease is endemic in Yamanashi and Okayama, at Hiroshima in Hondo, at Saga in Kiushu, in Katayama and Tagami, all cases being *S. japonicum*.

In Korea the disease is said to be very common, but I know of no record of cases.

In the Philippine Islands, the islands of Luzon, Samar, Leyte and Mindanao are infected with *S. japonicum*.

America: On the continent of North America cases, probably imported, have been reported from San Francisco (*S. mansoni*), Wisconsin (*S. japonicum*), Chicago and New York, and Leger states that "intestinal bilharziasis is frequent in the southern parts of the United States," but quotes no authority, and I know of no record of cases from there. On the other hand, in records of 114,000 persons *ex* the Southern States, both whites and coloured persons, whose fæces have been examined by competent observers for helminth eggs, and where details of all findings have been given, there is no mention of schistosomes. I think we must take it then that North America is free from infection by any known human schistosome.

The same would appear to be true of Central America, except that in Panama along the Canal route many cases have been reported. All these cases, however, with but two exceptions, were cases of *S. mansoni* occurring in labourers coming from the West India Islands or Dutch Guiana, where *S. mansoni* is endemic. The two exceptions were (1) a case of *S. hæmatobium* coming from Egypt, and (2) a case of a Barbadian with terminal-

spined ova in his fæces and suffering from severe "dysentery" (again a curious aberrant case of severe "dysentery" associated with terminal-spined eggs, and in a native of an island where *S. hæmatobium* is not known to occur).

In the Panama Republic, outside the Canal zone, there is no record of schistosomiasis occurring, and an examination of the stools of 109,962 persons failed to reveal any schistosome eggs.

In South America, Venezuela shows a very heavy infection at Caracas, and at the hospital at Varga, 22 per cent. of all post-mortems revealed infection with *S. mansoni*. No other species is recorded.

Dutch Guiana is infected with *S. mansoni*.

In French Guiana a considerable number of cases of *S. mansoni* have been reported, all but one having occurred in persons coming from infected countries, although two of these had only been in Algeria, one twenty and the other twenty-nine years previously, and Algeria is not "known" to be infected with *S. mansoni*. One case is reported of a native Guianian who had never left the country and had always lived on the coast.

In British Guiana, Demarara is known to be infected with *S. mansoni*.

Brazil is heavily infected, principally in the States of Sergipe, Bahia, Minas, Minas Geraes, Acre, Alagoas, Pernambuco, Parahyba, Rio Grande do Norte, Goyaz and Amazonas. The States of Ceara, Espirito Santo and Piauhy are also probably infected, the only species found throughout being *S. mansoni*.

Lutz states that cases of *S. mansoni* have been reported from Colombia and Peru

Of the West India Islands: Jamaica is infected, but probably not to a very great extent. Cases from this island have been found in the Panama Canal Zone. *S. mansoni* is the only species reported. Puerto Rico is heavily infected with *S. mansoni*.

Of the Virgin Islands, Culebra and Vicques are infected.

Of the Lesser Antilles: St. Martin, St. Kitts, Antigua, Guadeloupe, Grande Turk, Marie Galante, Martinique, Sta. Lucia, together with Barbados and Trinidad.

The only form found in the West India Islands is *S. mansoni*.

Lutz in 1919 stated that Cuba "must be counted among the principal centres of schistosomiasis (*mansoni*) in the New World," but he gives no record of cases, nor have I so far come across any records of such elsewhere. On the other hand, Guiteras in 1921 definitely states "there is no schistosomiasis in Cuba."

Australia has produced at least three indigenous cases of *S. hæmatobium*, one at Newcastle, New South Wales, in 1906, and two others, described by Nelson in 1912, as having probably derived their infection from an infected soldier returned from the Boer War. What the Great War has done for Australia in this way remains still to be seen.

SUMMARY.

Human schistosomiasis has a world-wide distribution between 38° N. and 35° S. latitude.

Each species of schistosome has certain geographical areas in which it is the sole species found or in which it is greatly predominant.

S. hæmatobium appears to be the sole species found in South Western Asia, and it is greatly predominant in South Africa, Egypt and the Soudan, and in the whole of Coastal Africa.

S. mansoni alone is found in Central Africa and and in the New World.

S. japonicum is the only species met with in China, Japan and the Philippine Islands.

Within the schistosome zone are large areas in which no species of the parasite has, so far, been found, the principal of these being India, Burma, Siam, the Malay Peninsula and the Sunda Islands in the Old World, the United States of America, Mexico, the States of Central America, Haiti and the West Indian Islands north of 19° N. latitude in the New, together with the Islands of the Pacific.

Case of Milky Ascites (T. Guldmann, *Hospitalstidende*, February, 1921).—The author reports a case of traumatic chyloperitoneum in a boy of 14. The tear in the mesocolon, through which the milky fluid oozed, was saturated with catgut, which resulted in complete recovery. In another case of the same kind the boy was suffering from rupture of the thoracic duct. Feeding by the rectum resulted in arresting the chylorrhœa, and the rupture healed. In a case of chylothorax through a tuberculous gland the pleura was cleared out and the patient recovered.

The Effect of Emetine on Entamœba histolytica in Stools (W. Allan, *Journ. of Pharmac. and Exper. Therap.*, August, 1920).—The author points out the difficulties in the way of determining the strength of emetine lethal for entamœbæ *in vitro:* (1) The obligatory parasite dies soon after it leaves the body, so that the element of time, so important in estimating the action of any drug, cannot be properly taken into account. (2) Death or fatal injury to the organism is hard to determine without disintegration. (3) The organism cannot be cultivated. (4) The alkaloid combines with other organic matter in the stool at times and becomes inert. (5) Entamœbæ buried in the mucus are well protected against water or normal salt solutions of emetine. In all the experiments carried out by the author which were made by solutions of emetine upon entamœbæ derived from various sources the effect of the emetine was *nil*, there being no signs of change in either the appearance or the motility of the entamœbæ in solutions weaker than 1:2,000 in the space of one or two hours, and even dilutions of 1:150 did not kill the entamœbæ in the same time.

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THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 15, 1922.

EDUCATIONAL NOTES ON TROPICAL MEDICINE.[1]

TROPICAL MEDICINE.

THERE are large and important schools of Tropical Medicine in London and Liverpool, and several universities and other examining bodies have instituted diplomas or degrees in the subject. The Colonial Office now expects all nominees for the Colonial Medical Service to pass through one or other of the two schools mentioned before their appointments are confirmed, and commercial firms engaged in tropical enterprise commonly demand from medical applicants for employment corresponding evidence of special knowledge. Information with regard to these schools and diplomas and degrees follows.

Diplomas and Degrees.

London University.—Tropical medicine is one of the six branches in which the M.D. degree may be obtained. The regulations relating to the curriculum and examination correspond to those applying to the other branches.

London Conjoint Board.—This body grants a diploma in tropical medicine to candidates after an examination usually held in the months of April, July and December. Ordinary candidates must present evidence of having attended, subsequently to obtaining a registrable qualification in medicine, surgery and midwifery, (1) practical instruction in pathology, protozoology, helminthology, entomology, bacteriology and hygiene in relation to tropical medicine, in an institution recognized for this purpose, during not less than three months; (2) the clinical practice of a hospital recognized for the study of tropical diseases during not less than three months. These conditions may be modified in the case of candidates who have had practical experience in tropical countries. The fee for admission to the examination is £9 9s. The Board also grants diplomas in psychological medicine and in opthalmic medicine and surgery. Candidates must hold a medical qualification registrable in the United Kingdom or be graduates in medicine of an Indian, Colonial, or foreign university. Particulars and conditions of admission to these examinations, fees, &c., may be obtained from the Secretary of the Examining Board, Examination Hall, Queen Square, Bloomsbury, London, W.C.1.

University of Liverpool.—A diploma in tropical medicine is given by this university to students who have been through the courses provided by the Liverpool School of Tropical Medicine and have passed the examination held twice yearly by the university examiners. The subjects of examination are (*a*) tropical pathology, parasitology, and entomology; (*b*) tropical and applied bacteriology; (*c*) tropical hygiene and sanitation; (*d*) tropical medicine, including ætiology, symptoms, diagnosis and treatment of tropical diseases. Further information can be obtained from the Dean of the Faculty of Medicine, University of Liverpool.

University of Cambridge.—This university grants a diploma in tropical medicine and hygiene to any person whose name has been on the *Medical Register* for not less than a year provided that he passes the examination of the university in this subject. Previous to admission to the examination he must produce approved evidence that he has studied

[1] Extracted from the Education Number of the *British Medical Journal*, September 2, 1922.

pathology (including parasitology and bacteriology in relation to tropical diseases), clinical medicine and surgery at a hospital for tropical diseases, and hygiene and methods of sanitation applicable to tropical climates. Examinations are held in January and August each year, and last four days. The fee for the examination and diploma is 9 guineas on admission or readmission. Application for further information should be made to Dr. G. S. Graham-Smith, Pathological Laboratory, Cambridge.

Schools.

London School of Tropical Medicine.

This school is under the auspices of the Seamen's Hospital Society. The laboratories, museums, library, &c., are within the building of the Hospital for Tropical Diseases, Endsleigh Gardens, N.W.1, and excellent opportunities are afforded to students and others who may be desirous of studying diseases incidental to tropical climates before entering the services or going abroad. In the wards of the Hospital for Tropical Diseases are to be found cases of tropical disease such as may be met with in actual practice in the tropics. There are three courses in the year lasting three months, beginning September 25th, January 9th, and April 24th approximately. The course is so arranged as to equip men for the Cambridge D.T.M. and H. and the D.T.M. and H. of the Conjoint Board. Tropical Medicine has been admitted as a sixth alternative subject for the M.D. of the University of London, and the school curriculum is adapted to afford facilities for candidates desirous of taking out the M.D. in this subject. Further information may be obtained from the Dean, London School of Tropical Medicine, India Office, Whitehall, London, and the Secretary, London School of Tropical Medicine, Seamen's Hospital, Greenwich, S.E.10.

Liverpool School of Tropical Medicine.

This school is affiliated with the University of Liverpool and the Royal Infirmary of Liverpool. Two full courses of instruction are given every year, commencing about January 6th and September 15th, lasting for the term of about thirteen weeks, and followed by the examination for the diploma of tropical medicine given by the University of Liverpool. Two courses in veterinary parasitology are also given, commencing about the same dates as the diploma courses. In addition to the full courses, an advanced course of practical instruction in tropical pathology and medical entomology, lasting a month, is given every year in June; it is of such a kind as to be very useful to medical men returning from the tropics on short leave. A special course of instruction in entomology, &c., is also given three times a year to officers of the East and West African Colonial Services. Students of the school who do not care to undertake the examination held by the university at the end of each term for the diploma in tropical medicine are given a certificate for attendance if the latter has been satisfactory.

Fees.—The fee for the full course of instruction is 20 guineas, with an extra charge of 1 guinea for the use of a microscope, if required. The fee for the Diploma Examination is 5 guineas, for the Advanced Course 6 guineas, and for the course in veterinary parasitology 15 guineas.

The new laboratories of the school adjoin the university and the tropical ward of the Royal Infirmary. The dimensions of the building are 162 ft. in maximum length by 84 ft. in width. In addition to the basement, in which are accommodated the photographic department and large storage rooms, there are four floors. The ground floor has: (1) Lecture theatre, with accommodation for about seventy students; (2) library; (3) a spacious museum, with preparation room adjoining. The first floor has twelve rooms, in which are housed the Departments of Tropical Medicine and Entomology. The second floor has the main class laboratory, 69 ft. by 58 ft., excellently lighted, and three other rooms, devoted to the Department of Parasitology. The third floor has a large research laboratory and two research rooms. On the roof is an insectarium, a mosquito-proofed house, and other accommodation.

Since it was instituted the school has dispatched to the tropics thirty-two scientific expeditions, many of the workers having been taken from among its students. The work done by them has been published in twenty-one special memoirs, besides textbooks and numerous articles in the scientific press, also in the *Annals of Tropical Medicine and Parasitology* of the school. In connection with the school are (1) the Manáos Research Laboratory in Brazil, and (2) the Sir Alfred Lewis Jones Tropical Laboratory, Sierra Leone, which was opened on January 10th, 1922. Further information may be obtained from the Hon. Dean, School of Tropical Medicine, Pembroke Place, Liverpool.

Indian Medical Service.

For some years before the war the pay and conditions of service in the I.M.S. were unfavourable. The pay, furlough pay, and pensions were inadequate; leave was difficult to obtain; the status of administrative medical officers was unsatisfactory. The new terms offered by the Secretary of State for India were announced in 1920, and the Representative Body of the British Medical Association, finding that they satisfied the Association's demands, resolved unanimously to accept them.

Under the reform scheme now being brought into effect medicine is a transferred subject—that is to say, it will in future be under the control of the Provincial Governments and legislatures. In the present state of transition the position which the Indian Medical Service will in future occupy is not well defined, and it seems unnecessary, therefore, to reproduce here in full the conditions of service.

Full details and particulars can, however, be obtained from the Secretary, Military Department, India Office, Whitehall, London, S.W.1.

It is, we understand, possible that a scheme of appointments to the Indian Medical Service for a limited period may be promulgated before long.

The Royal Naval Medical Service.

A Warning.

In January, 1920, as a consequence of the report of the Jerram-Halsey Committee, new regulations for retirement of officers came into force in the Royal Navy, and new rates of pay were laid down. The new regulations inflicted a great injustice upon a considerable number of surgeon commanders who were nearing, or had passed, the new retiring age. The grievance arose under two heads—age of retirement and rate of pension—and frequent remonstrances were addressed to the Admiralty by the British Medical Association. An account of the matter will be found in a leading article in the *British Medical Journal* of July 8, 1922 (p. 52).

Medical Practice in British Dominions and Foreign Countries.

Medical Acts have now been passed in almost all places forming part of the British Empire beyond the seas, and registers of duly qualified practitioners are consequently maintained. To these registers medical men educated in the United Kingdom are always admissible merely on payment of a registration fee, providing they produce evidence that they are of good repute and are either registered or eligible for registration in the United Kingdom, as the local requirement may be. The only exception to this statement that need be made relates to the Dominion of Canada. Each of its provinces acts in medical matters as an independent State. The result has been that reciprocity of practice has been established between this country and all the Provinces of Canada except British Columbia, where certain obstacles still remain to be overcome. We would advise any medical man proposing to practise in Canada first to communicate with the Provincial Registrar, stating what degrees or diplomas he holds, and asking for information as to the precise steps he must take in order to obtain admission to the Provincial Register.

Italy, Japan, Egypt, and (within certain limitations) the Principality of Monaco, are the only foreign States which accord a right to practise in virtue of British degrees and diplomas, though the authorities of Holland and Greece sometimes exempt British practitioners from portions of the examinations imposed on ordinary candidates for registration. In all other Continental countries a British medical man desiring to exercise his profession therein must pass practically the same examinations as those imposed on natives of the country. The same observation applies to all foreign States in the South American continent. Each of the United States of North America has its own laws and regulations governing medical practice; some of the States admit any holder of a degree or diploma to their Register, but the majority require a candidate for registration to submit to an examination.

A pamphlet showing the conditions under which medical and dental practitioners legally qualified in their own country may practise abroad can be obtained from the office of the General Medical Council, 44, Hallam Street, Portland Place, London, W.1, price 2s. 6d., or 2s. 9d. post free in the United Kingdom. Practitioners who think of going abroad to practise will find therein much useful information, including the name of the official in each country to whom requests for further particulars should be addressed. The last edition was published in January, 1921.

Medical Appointments under the Colonial Office.

Appointments to the Medical Services of the Colonies and Protectorates under the administrative control of the Colonial Office are made by the Secretary of State for the Colonies. Such appointments are to the service of a given colony or colonies, for there is no unified service directly administered from the Colonial Office. It follows that conditions of service and superannuation are in the main determined by the economic resources and general public health policy of the individual colony and its local government, and vary almost as widely as do conditions of climate. Moreover, the extent of the control exercised by the Colonial Office varies according to the constitutional status of the particular colony, and the detailed information available centrally is not always complete. The intending candidate, therefore, should make comprehensive inquiries as to local conditions before applying for an appointment, and will do well to supplement official information by reference to the central office of the British Medical Association, where reports obtained from time to time from the local Branches are available. This is the more necessary because facilities for transfer from the service of one colony or group of colonies to that of another are as yet practically non-existent, except in connection with a few specialist and senior appointments; this sets strict limits upon the opportunities for promotion.

The bulk of the medical appointments made by the Secretary of State in this country are to the services in the East and West African Colonies and Protectorates, the Straits Settlements and Malay States, the East Indies, and Fiji and the Western Pacific. In general, candidates for such appointments must be between the ages of 23 and 35; and whilst these limits are not for the moment absolute, an officer over 35 years of age on first appointment may be required to serve on a temporary and non-pensionable footing; regular appointments are, subject to a varying period of probation, for the most part permanent and pensionable. There is no

entrance examination, but practitioners selected for appointment must obtain a certificate of physical fitness from one of the Medical Advisers of the Colonial Office. In the case of the West African Medical Staff and the East African Services successful candidates are required to undergo an approved course of instruction in tropical medicine.

Colonial Service: The Outlook.

Whilst colonial service offers undoubted attractions to some practitioners it also presents very definite disadvantages, and not the least of these is, at the present time, uncertainty as to the future. Before the war conditions in several of the Services gave rise to considerable anxiety; the greatly enhanced cost of living during the war resulted in certain more or less inadequate temporary advances in remuneration, but consideration of the radical reforms required was postponed until the succeeding period of reconstruction. In 1919 a Departmental Committee under the Chairmanship of Sir Walter Egerton was appointed to consider the position of the Services generally, the means of securing contentment within them, and the maintenance and increase of the supply of candidates. The Committee found that the ideal to be aimed at was the creation of a unified Colonial Service, recruited by competitive examination and represented on the staff of the Colonial Office by a Medical Director-General. As an immediately practicable step in this direction it recommended the assimilation of the medical services in neighbouring colonies, and more especially those in the East African and Malayan groups. A permanent increase of salaries with a general minimum of not less than £600 a year on first appointment was recommended; the necessity for study leave was recognized, as was the need for the development of facilities for research; an increase in the number of specialist appointments and adequate provision for promotion by transfer from the service of one colony or group to that of another were other points emphasized.

Progress along the lines laid down by the Committee, which correspond broadly to the policy adopted by the British Medical Association, has undoubtedly been made since the report of the Committee was issued. With the exception of the West Indian Services, the Fiji and Pacific Colonies, and a few of the smaller dependencies which each offer only one or two medical appointments, the adoption of the £600 minimum or its equivalent in local coinage has been achieved. The commencing pay in the West African Medical Staff is £660 a year. For all practical purposes the Services in the Malay Peninsula have been unified, and some steps have been taken towards the assimilation of the East African Services, whilst there has been an appreciable increase in the number of specialist appointments and the facilities for research. The Services, however, remain understaffed. Opportunities for promotion, failing means of transfer from one service to another without loss of pension, must remain inadequate. Certain services, notably those in the West Indies and Fiji, have not yet secured that measure of reform essential to a minimal standard of efficiency, and it seems clear that the final unification of the East African Medical Services under conditions approximating to those of the West African Medical Staff will be indefinitely postponed.

Moreover, the acute economic depression of the last two years has affected many of the colonies with almost crushing severity, and has in some cases brought about the indefinite postponement of projected reform, and in others practically neutralized advances in remuneration that were at one time thought to be permanent, besides imposing disastrous restrictions on the public health programme in many places. Nor do economic difficulties, radical though they are, stand alone. The constitutional status of the colonies is under review. Schemes for regrouping and for the concession of greater local autonomy may be temporarily delayed pending economic recovery, but it is not unreasonable to suppose that until such questions are settled there can be little progress towards the unification of the Colonial Medical Service. Their adoption, on the other hand, may entail the formulation of a new solution for the admitted difficulties. The future is therefore extremely uncertain, and in spite of the definite advance recorded above it is impossible at present to modify the warning that prospective candidates should consider carefully whether they may not be well advised to look elsewhere for a career. Caution is especially necessary in connection with appointments in the West Indies and Fiji. The position as regards the West Indies was fully discussed in these columns in connection with the Report of the Under-Secretary of State for the Colonies on his recent tour in the West Indies (*British Medical Journal*, July 15, 1922, p. 99, and *Supplement*, p. 22). The position in Fiji is at the moment engaging the attention of the Dominion Committee of the British Medical Association in connection with representations received from the Fiji Branch.

The condition of the Colonial Medical Services has for some time been a matter of the gravest concern to the Association, which gave evidence on the subject before the Egerton Committee, and has been in constant communication with the Colonial Office on matters touching their welfare since August, 1921. During this period the Association has, in effect, been recognized as the mouthpiece of the Services, and has received copies of all official documents primarily affecting medical officers, and also the gazettes of the various local governments. It has therefore been possible to supplement the activities of the Overseas Branches by the exercise centrally of unceasing vigilance over all tendencies likely to affect the development of the Colonial Services. It cannot be too strongly emphasized, however, that present conditions render immediate advance impracticable.

Official Sources of Information.

All inquiries in connection with colonial medical appointments made by the Secretary of State for

the Colonies should be addressed to the Assistant Private Secretary (Appointments), Colonial Office, Downing Street, S.W.1. Any vacancies occurring in Iraq, Palestine and Aden are recruited through the Colonial Office, and information can be obtained at the same address. Vacancies also occur, though at rare intervals, in the Sudan, and inquiries as to these should be addressed direct to the Civil Secretary, Sudan Government, Khartoum. Inquiries about any medical appointments made by the Egyptian Government should be addressed to the Director-General, Public Health Department, Cairo.

Information as to medical appointments in the self-governing Dominions and their dependencies can be obtained on application to the High Commissioners or Agents-General for the Dominions. Intending applicants are also recommended to consult the Colonial Office List and the Professional Handbook (price 6d.) issued by the Overseas Settlement Office, 6, St. James's Square, S.W.1.

There remains a number of medical appointments made by the mining companies and other commercial undertakings in various parts of the tropics. Much caution should be exercised in accepting such posts, and the form of contract should be subjected to very careful scrutiny. Advice in this connection should always be sought at the central office of the British Medical Association.

Medical Missionaries.

To medical men suitably endowed the mission field offers opportunities for interesting work. There are now 415 medical practitioners holding British degrees or diplomas employed in different parts of the world by missionary societies, and the latter seem to stand in constant need of men and women to fill vacancies as they occur, and also to enable them to take advantage of fresh openings. Since the conclusion of the war there has been a large number of such vacancies, as most of the mission hospitals are working with depleted staffs. Further, the development of native medical schools as training institutions in connection with some of the larger mission hospitals affords excellent scope for most useful work to medical men who are qualified to teach. It is not usually expected or desired that a medical missionary should take a position such as would otherwise be occupied by an ordained clergyman or minister. But it is essential that he should be prepared to take his share of definite missionary work in any hospital in which he may be placed. As for scientific and other qualifications for the work, a medical missionary, in addition to being physically capable of sustaining what may prove to be a trying life, should be a thoroughly well-trained physician and surgeon. It is very desirable that he should have held a resident appointment at a general hospital and have a good knowledge more particularly of practical surgery, tropical medicine, and the treatment of eye diseases. Societies from whom useful information can be obtained are the London Medical Missionary Association, 49, Highbury New Park, N.5; the Edinburgh Medical Missionary Association, 56, George Square, Edinburgh; the Church Missionary (Medical Mission Department), Salisbury Square, London, E.C.4; the Society for Promoting Christian Knowledge, Northumberland Avenue, W.C.2; and the Medical Missions Department of the Society for the Propagation of the Gospel in Foreign Parts, 15, Tufton Street, Westminster, S.W.1.

TELEGRAM RECEIVED FROM INDIA.

Weeks ending August 19 and 26, 1922.

Maritime Towns.

	Week ending August 19	Week ending August 26	Deaths
Cholera:			
Calcutta ...	3 ...	5 ...	8
Rangoon ...	2 ...	1 ...	3
			11
Plague:			
Calcutta ...	5 ...	— ...	5
Bombay ...	13 ...	6 ...	19
Rangoon ...	33 ...	40 ...	74
			98
Influenza:			
Calcutta ...	12 ...	10 ...	22
Bombay ...	3 ...	5 ...	5
Rangoon ...	9 ...	4 ...	2
Madras ...	1 ...	— ...	22
			51
Small-pox:			
Calcutta ...	— ...	1 ...	1
Bombay ...	— ...	— ...	—
Madras ...	25 ...	22 ...	47
Rangoon ...	1 ...	2 ...	3
Karachi ...	— ...	1 ...	1
			52

Provinces: Week ending August 19, 1922.

Plague.—Spreading in the Poona and Belgaum districts of the Bombay Presidency, the Bellary, Salem, Nilgiris and Malabar districts of Madras, the Prome, Henzada, Thaton, Yamothin and Kyaukse districts of Burma and the Northern Shan States; *reinfected* the Myingyan district of Burma.

Cholera.—Increasing in the Dharwar district of the Bombay Presidency, the 24 Parganas and Nadia districts of Bengal, the Ganjam, Vizagapatam, Nellore and Chittoor districts of Madras; the Champaran, Muzaffarpur and Cuttack districts of Bihar and Orissa and the Henzada, Myingyan, Myaungmya and Pakokku districts of Burma; *reinfected* the Prome district of Burma; *freshly infected* the Trichinopoly district of Madras and the Bhagalpur district of Bihar and Orissa.

Small-pox.—Spreading in Lahore City, the Jalpaiguri district of Bengal, the Nellore, South Arcot, Tanjore, Cuddapah, Bellary, Anantapur, North Arcot and Nilgiris districts of Madras and the Shwebo district of Burma; *reinfected* the Insein and Thayetmyo districts of Burma; *freshly infected* the Guntur and Chittoor districts of Madras.

Influenza.—Unimportant.

Provinces: Week ending August 26, 1922.

Plague.—Spreading in Maymyo town, the Madura, Bellary, Salem and Coimbatore districts of Madras and the Muzaffarpur district of Bihar and Orissa and the Meiktila district of Burma; *reinfected* the Southern Shan States and the Pyapon district of Burma; *freshly infected* the Sholanpur district of the Bombay Presidency.

Cholera.—Increasing in the Nadia, Bogra and Tippera districts of Bengal, the Bhagalpur district of Bihar and Orissa and the Myingyan district of Burma; *reinfected* the Magwe district of Upper Burma; *freshly infected* the Kolaba district of the Bombay Presidency and the Tanjore district of Madras.

Small-pox.—Increasing in the Jalpaiguri district of Bengal, the Guntur, Chingleput, Tanjore, Madura, Ramnad, Tinnevelly, Kurnool, Bellary, Anantpur, Coimbatore and South Kanara districts of Madras; *reinfected* the Akyab, Sandoway, Hanthawaddy, Henzada and Yamethin districts of Burma; *freshly infected* the Sukkur district of the Bombay Presidency.

Influenza.—Unimportant.

Annotations.

"*Hunger-osteomalacia*" *in Vienna*, 1920. *I.—Its Relation to Diet* (Elsie J. Dalyell, M.B., and Harriette Chick, D.Sc., *Lancet*, vol. cci, No. 5121, 1921).—The occurrence of "hunger-osteomalacia" in Vienna during the period of greatest food deprivation, its incidence among the poorest inhabitants, and the beneficial effect of improved diet without any other form of treatment, suggested that the disease was of dietetic origin.

The disorder affected chiefly middle-aged and old people of both sexes. The characteristic symptoms of the conditions are pain on body movement, a waddling gait, difficulty in mounting stairs, severe pain in sacral region on pressure or movement, and pain in the ribs on compression of the thorax. Tetany may occur in connection with the disease.

Forty-eight cases were treated by making additions to patients' diets in the form of carbohydrates, cereals, and fats of various kinds.

Little improvement could be demonstrated after addition to the diet of sugar or cereals (i.e., extra calories without fat), although in many instances the previous diet had been very scanty. Recovery followed the addition of either cod-liver oil, butter, oleo-margarine containing 80 per cent. of animal fat, or olive oil. The beneficial influence was in the order named above, cod-liver oil being far the most effective.

Some of the severer cases did not improve until cod-liver oil was given. That the relative therapeutic value of the fats used corresponds roughly with their content in the fat-soluble A vitamine is regarded as significant. It is also possible to interpret the remission of symptoms of "hunger-osteomalacia" in summer and their relapse in winter as due to varying supplies of vitamine A in the diets, for during summer inclusion of green vegetables in the diet provides a valuable source of this vitamine. One attempt, however, to cure a severe case with a fat-free diet, rich in green vegetables, was not successful. More observations are needed on this point.

The increase in Vienna of rickets in children and late rickets in young adults, simultaneously with the occurrence of "hunger-osteomalacia," suggests that the three disorders may be due to the same source.

Treatment of Diabetes Mellitus (Lenné, *Deutsche medizinische Wochenschrift*, July, 1921). The author is of the opinion that it is not the purpose of treatment to eliminate glycosuria under all circumstances. It is often necessary to be content with getting the diseased organ to perform its functions reasonably well, in order to improve the general condition of the patient both subjectively and objectively, even though the glycosuria persists. Many patients feel better on a more liberal diet with slight glycosuria than they do on a stricter diet with sugar-free urine. Various proteins have different effects on glycosuria, and in the same way there is a marked difference in the way various carbohydrates affect different types of patients. Oatmeal is good for some patients and bad for others; the same applies to potato starch and rice starch. If on substituting other carbohydrates it is found that the capacity for improvement in assimilation has been lost, here is the time when further limitation of proteins and the introduction of fast days are indicated, after which the diseased organism takes on new strength as shown by a better assimilation of carbohydrates; if, on the other hand, such a reaction does not occur, it is a bad sign.

Malaria in Cuba (J. F. Artega, *Ann. d'Igiene*, Rome, vol. xxxi, No. 3, March, 1921).—During the war malaria prophylaxis was seriously neglected in Cuba owing to the increased sugar production; now, however, it should be looked into again, especially as regards anti-mosquito work. Besides possessing the conditions found elsewhere that are favourable to mosquitoes, Cuba has a number of *Bromelaceous plants* that may serve as breeding places owing to water collected in their leaves. Petroleum, lime and carbide residue are recommended for use against the larvæ, while fumigation

with sulphur, pyrethrum, leaves of *Stramonium*, creolin and tobacco are advised against the adults. A repellant for individual use is a mixture of essence of eucalyptus 30 grm., talc 60 grm., and starch 120 grm.

Granuloma Inguinale (K. M. Lynch, M.D., *Journal of the American Medical Association*, vol. lxxvii, No. 12, September, 1921).—After considerable experience with cases of granuloma inguinale, the author has come to the conclusion that from a therapeutic point of view cases of this disease can be divided into four different classes:—

(1) Small granulomas, amenable to excision, followed by tartar emetic injections.

(2) Pure cases in which curet and actual cautery remove the exuberant tissue, with follow-up tartar emetic injections until healed, and at longer intervals for some time thereafter.

(3) Pure cases in which curet and cautery may not be used, but which will heal under persistent tartar emetic therapy.

(4) Other diseases, particularly syphilis, complicated by granuloma infected with Donovan's organism, in which tartar emetic alone appears to be without effect.

In the first three groups good results are expected, but in the fourth an effectual combined therapy to fit each case must be evolved.

The Value of Laboratory Reports on Stools in Cases of Suspected Amœbic Dysentery, and their Interpretation by the Clinician; with a Special Note on the Diagnostic Significance of Charcot-Leyden Crystals (John Gordon Thomson, M.B., Ch.B., and Andrew Robertson, M.B., Ch.B., *Proceedings of the Royal Society of Medicine*, vol. xiv (Section of Tropical Diseases and Parasitology), 1921).—The authors come to the following conclusions:—

(1) There should be close understanding between the clinician and the pathologist with regard to the diagnosis of protozoal diseases.

(2) The clinician should not construe a negative finding in one or two stools to mean that his patient is not suffering from amœbic dysentery.

(3) Considerable care should be shown in the selection of material to be sent to the laboratory for examination.

(4) The macroscopic and microscopic appearance in the stools of pure uncomplicated cases of amœbic dysentery and of bacillary dysentery are very characteristic.

(5) Charcot-Leyden crystals are probably the result of the cytolitic action of *Entamœba histolytica* on the body cells.

(6) Charcot-Leyden crystals are present in a very high percentage of cases of amœbic dysentery, and are more commonly present when the disease is of long standing.

(7) The presence of Charcot-Leyden crystals in human stools is diagnostic of amœbic colitis due to *E. histolytica*.

Kaolin in the Treatment of Asiatic Cholera: its Action and Uses (R. R. Walker, B.Ch., *Proceedings of the Royal Society of Medicine* (Section of Therapeutics and Pharmacology), vol. xiv., No. 12, October, 1921).—The author comes to the following conclusions:—

The action of kaolin is two-fold: (1) Mechanical; (2) Adsorptive.

(1) *Mechanical.*—Such large quantities of kaolin as are used in the treatment of cholera almost fill the bowel, and the passage of this mass through the bowel must enclose and carry with it a very large number of bacilli. Kaolin has no bactericidal effect, and this fact calls for energetic action in the destruction of fæces in all cholera cases treated by this method. The fact that the kaolin forms an adherent coating to the walls of the bowel point to its usefulness in ulcerative forms of colitis, though in these cases the rectal method of administration in the form of enemata and long tube lavage would be preferable owing to the possibilities of errors of digestion arising, after long administration, from the adsorptive properties of kaolin for ferments.

(2) *Adsorptive.*—This, the chief function of kaolin, is very charactertistic—its extremely fine state of division promotes that end.

From the above experiments it is clear that, at least in the case of cholera, and probably in diphtheria, ptomaine poisoning, bacillary diarrhœa, summer diarrhœa and general toxic conditions, kaolin has a wide range of use.

In the case of cholera, the first result of its administration is the cessation of vomiting. This seems to be due to the absorption of toxic bodies in the upper alimentary tract. This is followed by the cessation of the diarrhœa and consequent loss of fluid caused by the presence in the bowel of irritant substances of a toxic nature. These, being adsorbed by the kaolin, cease to act as an irritant, and consequently the improvement of the patient is rapid and maintained.

The presence of a layer of kaolin on the walls of the intestinal tract appears to act in part as a filter bed, preventing the transmission of toxins to the patient.

The adsorptive action of kaolin does not seem to be chemical. Professor Bayliss has pointed out that kaolin is an electro-negative colloid, whose sign may become changed by allowing it to absorb ions of opposite sign to itself. This apparently occurs in the small intestine.

I am indebted to Professor Russ and Mr. Clark for the following fact (experiments were made after Hardy's method, *Journal of Physiology*, xxxiii, p. 289): Cultures of *Vibrio choleræ* in an alkaline medium gave a definite electro-negative sign.

The adsorption of cholera toxins by the kaolin may be explained by the electrical reaction between

the two, and the failure of the toxin to reach the circulation may be explained by the electrostatic attraction of the suspensoid kaolin for the cholera toxin, which thus forms one component of a Helmholtz double layer.

Professor Bayliss has pointed out that sodium chloride diminishes electro-negative charge, in accordance with Gibbs's principle; this may be the explanation of the difference observed between cases of cholera which have had saline injections preceding the kaolin treatment and those treated by kaolin only.

Report on Rat-flea Investigation (R. Newstead, F.R.S., and Alwen M. Evans, M.Sc., *Annals of Tropical Medicine and Parasitology* vol. xv, No. 3, September, 1921).—Five species of fleas were found to occur on rats from the ship's port, and city of Liverpool. They were: *Xenopsylla cheopis*, *Ceratophyllus fasciatus*, *Leptopsylla musculi*, *Ceratophyllus londiniensis* and *Ctenocephalus canis*.

Xenopsylla cheopis occurred freely on ship rats throughout the whole period of the investigation. It was also found on three rats from the dock sheds, and isolated specimens were found on four rats from Zone IIB, and on two rats from Zone III. A permanent breeding place of the species was discovered in certain premises in Zone IIB.

Ceratophyllus fasciatus was universally prevalent during the whole course of the investigation. The number of fleas per rat was greatest during the summer months, but the curve of frequency could not be correlated in detail with that of the average temperature.

Leptopsylla musculi was most prevalent on rats from Zone II. It occurred very rarely upon ship rats. *Ceratophyllus londiniensis* was found rarely in Zones II and III, and of *Ctenocephalus canis* one specimen was taken from Zone III.

Toxicity of Tartar Emetic (Fernand Michiels, *Arch. Internat. de Pharmacodynamie et de Therapie*, vol. xxv, No. 3, 1920.)—The author describes the results of experiments with tartar emetic, which is being used in increasingly large quantities throughout the tropics, it being especially valuable in the treatment of bilharziasis, leishmaniasis and trypanosomiasis. It has been found that a single dose over the limit of safety—that is to say, a dose between 1 and 2 cg. per kilo body weight, causes death by paralysis of the respiratory centre. If a lethal amount of the drug be given in the form of *several doses* at frequent intervals, death is brought about by hypotension due to vaso-dilatation (absence of adrenalin or paralysis of the medullary centre controlling vascular tone).

The chief feature of antimony medication is the absence of drug accumulation in all cases except those to which doses approaching the toxic have been given at intervals of less than two or three days. Doses can be given for an indefinite period, provided each dose is half the toxic one, and that an interval of three days is allowed to elapse between each dose.

A Case of Leprosy with Elephantiasis (M. Mackenzie, *China Medical Journal*, vol. xxxiv, No. 5, September, 1920). A description is given of a case of leprosy in a Chinaman, aged 47, and a native of Foochow. The patient also had an elephantoid growth involving the whole of the scrotum and penis and weighing 23 lb., which was removed by operation. It is not known whether the tumour was due to the leprosy itself, or whether it was a case of filariasis occurring as a complication of the leprosy.

The Wassermann Test in Patients affected with Malaria in the Tropics (F. H. Hehewerth and W. A. Kop, *Journal of Hygiene*, vol. xix, No. 3, January, 1921).—Out of forty-one cases of active malarial infection in natives the Wassermann reaction was positive in 50 per cent., but this usually disappeared on treating with quinine. The idea of latent syphilis was eliminated by the fact that twenty-one healthy natives, similarly tested, were negative. The result obtained from these tests was that a positive Wassermann reaction in a country heavily infected with malaria cannot always mean evidence of syphilis.

The Prevalence and Character of Tuberculosis in Hong-Kong (H. H. Scott, *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 3, September, 1921).—In Hong-Kong the housing of the poorer Chinese is very bad indeed, the area being limited, and the Chinese population being large and constantly increasing, building sites have become expensive, so the streets inhabited are narrow, and the houses high, the height sometimes being five times the width of the street. A Chinese family usually occupies a single storey of a house, with the result that there are many families living one on top of the other. The houses themselves are poorly built, the windows being darkened by gratings and shutters. The result is that no sunlight ever reaches the rooms, and very little fresh air can be obtained. This tends to cause low resistance to disease. In Hong-Kong tuberculosis is a frequent cause of death, and it is put down to the poor conditions of living; the reasons for these conclusions are as follows: The hereditary transmission of the bacillus is so rare that for practical purposes it may be declared negligible; on the other hand, the incidence of tuberculosis depends on two main factors, the degree of exposure to infection and the resistance which the inoculated subject is able to put forward, this in turn being dependent largely on his environment.

Abstracts and Reprints.

SOME DATA ON THE BIO-AERATION OF SEWAGE.[1]

By Captain H. N. Stafford, M.C., and Captain A. W. Ward.

The data for this article were obtained in the course of an investigation into the bacteriological and chemical changes in sewage when treated by bio-aeration.

The method of dealing with sewage by this means has proved very successful, and demands precise knowledge of the changes involved. A description and diagram of a miniature plant constructed at Blackpool for experimental purposes, on the lines of the original plant erected at Sheffield, is given. This plant deals with a gallon of sewage at a time and is propelled by water. The necessary volume of sludge was obtained by a mixture of sludge and sewage containing 5 per cent. of the former being agitated by paddles in the agitation tank, and the supernatant liquor being drawn off.

The supernatant liquor was submitted to chemical and bacteriological examination, and tables are given which summarize the findings of the very numerous chemical analyses, and the bacterial findings.

An attempt was made to prove the thesis that in sewage treatment by ordinary biological filters, *Bacillus coli* plays the part of a passenger only, and to determine how far purification is dependent on the fresh organisms introduced to the sludge with every filling of sewage by treating sterilized sewage in the bio-aeration model. Sterilization was effected by boiling. Tables showing the chemical and bacteriological results are given.

The same sterilized sewage, to which measured numbers of typho-coli group organisms had been added before introduction into the tank, was experimented with and the results are given.

From these figures the inference is tentatively made for a large plant.

(1) That in a bio-aeration plant working to standards of chemical efficiency there is a marked diminution of organisms, and particularly of coliform organisms, in the final effluent, but not any better reduction than is obtained by other recognized sewage methods of sewage purification.

(2) That the reduction factor of *B. typhosus* is much more marked.

(3) That the coliform organisms are not, however, mere intruders, but probably play an active part in purification, the process being retarded in the absence of live sewage organisms.

(4) That sterilization of the effluent may be effected by the addition of four parts per million free chlorine from bleaching powder.

Further results, which agree remarkably with the above conclusions, have been obtained by Courmont, Rochaix and Laupen, and some of their findings are detailed.

The findings also of Richards and Sawyer, dealing with the activities of the organisms in the sludge are detailed.

In a bio-aeration plant sludge gradually accumulates in excess, and has to be disposed of. This activated sludge is of greater manurial value than ordinary sewage sludge, in respect of its nitrogen content, which is shown by figures of analyses from the miniature plant. It is evident that quite three times as much nitrogen is present in activated sludge as in ordinary sludge, a proportion found fairly constantly by workers all over the country.

[1] Abstracted from the *Journal of the Royal Army Medical Corps*. July, 1922, vol. xxxix.

A REPORT ON THE STEINACH OPERATION IN SENILITY AND PREMATURE SENILITY.[1]

By Abr. L. Wolbarst, M.D. (New York).

The testes exert a twofold influence on the human economy.

Spermatogenesis may be compared to the external secretion of other glands. A second function is an internal secretion called an activator or hormone; this hormone furnishes the secondary sex character of the individual.

If it be true that the endocrine system takes the mental make-up of the individual, it is likewise true that his gonadal character is determined by the internal secretion of his testes. The testes are located in interstitial tissue or Leydig cells, which lie between the generative tubules of the organ; this interstitial tissue undergoes senile degeneration that the gonadal change takes place by characteristic symptoms of senility. To induce regeneration of glands or to retard senility, their object is to restore maintenance of the normal gonadal balance between spermatogenesis and testicular hormone production on the other.

The restoration of balance by resort to artificial means inhibits the generative tissues and a compensatory regeneration of Leydig cells or interstitial tissues and the rejuvenating effects on the endocrine system.

Researches in Animals.

(1) Transplantation in the senile subject of a gonadal organ from a young animal of the same or related species.

(2) Repeated mild exposure of gonadal organs to X-rays.

(3) Ligation and resection of vas deferens. The last-named method applied to man has been made popular in the experimental work of Steinach, of Vienna, and those who follow him. Resection of vas deferens is a spermastasis, and absorption of the sperma imprisoned in the testes by closure of efferent duct. The imprisonment succeeded to atrophy. The end result is a massive deposit of testicular hormone takes place in a successful transplant of a gonadal gland; hormone is created within the body of patient. The physical powers

[1] Abstracted from the *New York Medical Journal and Medical Record*, p. 543, May 3, 1922.

and sexual often follow a successful prostatectomy for senile hypertrophy; consider the result by unintentional Steinach operation, by accidental injury of the closure of ejaculatory ducts in the course of removal of the prostate. Eleven patients were operated, seven of whom actually senile and five premature.

Conclusions.

As the result of a study of these cases one is justified in saying the operation has been advantageous to those who have been subject to it. In senile patients marked decrease of blood-pressure. In these cases sexual function seems extinct.

THE FILTER-PASSER OF INFLUENZA.[1]

By Hon. Lieut. Colonel M. H. Gordon, C.M.G., C.B.E., M.D.

Human experiments have already gone far towards solving the ætiology of influenza. Although only negative or doubtful results were obtained by experiments with Pfeiffer's bacillus, the positive results with filtered material on human subjects reported by Nicolle, Lebailly, de la Riviere and others, and the experiments of several Japanese doctors, would appear to establish the fact that the primary infective agent in influenza is a filtrable virus.

During the pandemic of 1918 the late Major H. Graeme Gibson, Major Bowman, and Captain Connor showed that filtered or unfiltered sputum taken from cases of influenza at the earliest stage of the disease produced in the inoculated animals pulmonary lesions closely resembling those found in the lungs of patients who succumb at an early stage of influenza. They were also able to transmit the disease from animal to animal. They came to the conclusion that the primary infective agent in influenza is a filtrable virus, and that the micro-organism cultivated by them was in all probability the primary cause.

During the past three years Olitsky and Gates of the Rockefeller Institute have published a series of studies on the ætiology of influenza that have not only confirmed and added precision to those of Gibson and his colleagues, but also promise to place this matter of the filter-passing micro-organism on a new and firm experimental basis.

During a sharp outbreak of influenzal illness among the nursing staff of St. Bartholomew's Hospital, the author carried out experiments by the Noguchi method of culture. Two specimens of ascites fluid were experimented with, and their sterility was found to be above suspicion. The diluted nasal or pharyngeal secretion from four nurses within twenty-four hours of onset was put through filter paper, then through the Berkefeld filter. One c.c. of each filtrate was inoculated into each of two Noguchi tubes, and 1 c.c. into an ordinary broth tube, and experimented with. On examining the positive cultures with Gram's stain no bacteria could be found, and subcultures on ordinary agar failed to grow. When films of material taken from the foot of the positive cultures were fixed, stained and examined, swarms of minute round bodies were found. After consulting the literature of filter-passing micro-organisms, the author succeeded in finding these bodies in vaccine lymph. The conclusion was come to that these bodies in vaccine lymph are of the same order as regards morphology as those present in the influenza cultures. After further investigation the following results were arrived at:—

Primary Culture.—Material was obtained during the late outbreak of influenza in London from sixteen further cases within thirty-six hours of the onset of symptoms, and the filtrate from each was cultivated in Noguchi medium as before. Out of the total of twenty cases in which the filtrate of the nasal or pharyngeal secretion was examined in this way, evidence was obtained of the presence of a filter-passing organism in fourteen. In addition, filtrates from the bronchial secretion were cultivated from three fatal cases of influenza, with positive results in two. The secretion that gave the best growth of the filter-passer was literally swarming with Pfeiffer's bacillus; this bacillus, however, failed to pass the Berkefeld filter.

Similar material from seven cases of measles at the onset of the rash was examined, and in two of the cultures the presence of a filter-passing micro-organism was found, similar in morphology to that found in the influenza cultures.

Subcultures.—After three weeks' growth three of the primary influenza cultures were diluted, filtered, and the filtrate sown in fresh Noguchi tubes. Two gave a positive growth; in the third the result was doubtful.

Demonstration of the Filter-passing Organism in situ in the Secretion.—The minute filter-passing organism in large number in the nasal secretion during the first twenty-four hours of the disease has been successfully demonstrated. The secretion was clear and ordinary bacteria were scarce. The stain used was Giemsa, the stained preparations being differentiated as before in xylol and acetone. Confirmatory results were obtained with methyl blue, and in the last one with azure I as well. The secretions were filtered and yielded a positive growth of the filter-passer on the third to fourth day.

The morphology of the filter-passing micro-organism from the influenza cases has been accurately described by Gibson and his colleagues. Photographs are attached to the paper. The slow progress that has been made with the elucidation of filter-passers is due to the fact that these micro-organisms require a technique far more difficult to acquire than that which is adequate for dealing with ordinary bacteria. The recent work of Olitsky and Gates promises to simplify the technique of culture. Some simple and quick-staining method is needed which will tell for certain whether these very minute "stain-fast" organisms are present or

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, July, 1922, vol. xxxix, No. 1.

not in a given material. It is, of course, essential to fix these organisms very thoroughly before staining them. Several different methods can be tried. The matter of stains for demonstrating filter-passers calls for further investigation.

Search for the primary infective agent in influenza has led investigators into the realm of filter-passers, and revealed the presence of a micro-organism of this group.

Current Literature.

The Indian Medical Gazette.

Vol. LVII, No. 6, June, 1922.

Mass Treatment of Hookworm Infection (K. S. Mhaskar).—The author is of the opinion that one dose of thymol or betanaphthol treatment without purgatives is simple, effective and safe. As no previous microscopical examination of fæces is required, and as the drug need be administered but once, the treatment is likely to find favour with the masses.

The Detection of Anthrax Spores in Shaving Brushes (A. D. Stewart).—As regards the infection of the hair of brushes. The hair becomes infected during the operation of skinning and cutting up the animals which have died of anthrax. The bacilli in the blood and organs, on exposure to air, immediately spore, and the hair of the hide becoming soiled with the blood and discharges becomes intensely infected with spores. Unless the hair is very thoroughly washed and disinfected, these spores remain on the hairs during the process of being made up into brushes; and the infection may be carried to distant places, as they retain their vitality for long periods. It will be evident that the whole hair mass will be likely to harbour the spores; that is not only the projecting part of the brush, but also the part imbedded in the mount of the brush.

In order to examine brushes, they are placed (held by the handle) in a mortar containing sterile normal saline, and rubbed thoroughly with a glass rod. The liquid is collected and is the first washing. The washing process is continued as often as necessary until the washings are clean. All the washings are then centrifugalized, having been added together. The supernatant liquid is then run off; and the deposit, after adding sufficient saline to make an emulsion for manipulation, is used for investigation.

A Case of Fibroma Molluscum (D. F. Michael).—A description is given of a case of fibroma molluscum. The patient, aged 18, was a fisherman by occupation, and stated that the disease was of four years' duration. Was unduly short of stature and of poor physical development. Slight depression of the nasal bones and bulging of the thorax bilaterally outwards and forwards over the abdomen. Compensatory lateral curvature of the dorsal spine was also present. Distortion of the lower limbs, the left tibia being sabre-shaped, and enormous tumours. In addition to several small tumours at the back of the right ear, on the neck, and on the trunk, the largest hangs from the loose cellular tissue along the margin of the right iliac crest, and extends throughout the whole length, involving the entire gluteal region on the right side as an enormous pendulous mass, soft and painless. This continues round to the front of the right thigh, where apparently tumours of similar construction have combined, forming several loose pendulous folds as far as the knee-joint, which is free and otherwise normal. Below the knee is another fairly large tumour freely movable and somewhat firmer in consistency than the others. The anterior border of the right tibia can be distinctly felt through this tumour. The genito-urinary organs appear to be normal, and no disease of other vital organs can be detected.

Annals of Tropical Medicine and Parasitology.

Vol. XVI, No. 2, July 20, 1922.

The Incidence of a Disease in Population Groups, the Number of People in which is known or unknown (J. W. W. Stephens).—The author first of all emphasizes the distinction in meaning between the two uses of the word incidence—it is used in one sense, when it is only the number of cases that is known, and in a second sense when not only the number of cases but also the number of people among whom the cases occur is known, in which case the term "incidence" is applied to a figure expressing the number of cases that occur per hundred people in each group. It would seem advisable to confine the term "incidence" to the use of the term in the first sense, and the term "incidence rate" to the use of the term in the second case.

Tables are given showing incidences and ratios of incidence rates in various diseases.

Notes on Australian Cestodes.—V. Three Cestodes from the Black Swan (P. A. Maplestone and T. Southwell).—The three following species of cestodes were found in the intestine of *Chenopsis atrata*, Lath. (Black Swan), several of which were examined at Townsville, North Queensland:—

(1) *Nematoparatænia paradoxa*, n. g., n. sp.

(2) *Echinorhynchotænia nana*, n. sp.

(3) *Hymenolepis lanceolata* (Bloch), 1782), Weinland, 1858.

In this article detailed anatomy of each of three species is given.

On the Genital Armature of the Female Mosquito (A. Ingram and J. W. S. Macfie).—In this paper the authors record briefly the results of a preliminary examination of fifty West African species referable to sixteen different genera.

They have found, generally in most cases, well-marked differences between distinct genera, but only slight or almost inappreciable ones between species of the same genus.

In the examinations, pure carbolic acid was found to be a valuable reagent. When immersed in this fluid, the abdomen of the mosquito swells out and becomes transparent. The spermathecæ are also expanded by this treatment, so that they can be examined and measured.

Outline drawings accompany the description of each species.

Cryptocotyle Lingua (Creplin, 1825, Fischoeder, 1903) *in a Dog in England* (P. A. Maplestone).—Three specimens of this small fluke were recovered from a dog, killed in the Dogs' Home, Liverpool.

The following table sets out the principal dimensions and anatomical characters of the three specimens:—

	Specimen 1	Specimen 2	Specimen 3
Length and breadth	1·4 × 0·7 mm.	1·3 × 0·67 mm.	1·5 × 0·75 mm.
Oral sucker	108 μ	80 μ	96 μ
Pharynx	76 μ	76 × 76 μ	72 × 72 μ
Œsophagus	80 μ	60 ? μ	?
Bifurcation of intestine	260 μ from anterior end	220 μ from anterior end	?
Genital sucker	—	160 μ	148 μ
Testes	Right testis anterior	Right testis anterior	Right testis anterior
Ovary	3 lobes in line, 260 × 68 μ on left	4 or 5 lobes grouped together, about 120 μ across, on left	3 or 4 lobes grouped together, about 128 μ across, on left
Vitellaria	Meet anterior to ventral sucker. Left side runs as far as gut fork. Right not so far	Nearly meet anterior to sucker and a few follicles about reach gut fork	Do not meet anterior to sucker and do not reach gut fork on either side
Eggs	50 × 30 μ	48 × 24 μ	48 × 28 μ

Cestodes in the Collection of the Indian Museum (T. Southwell).—The specimens are divided under the following headings, with their numerous subdivisions into families, &c:—

(A) Mammals, (B) Pigeons, (C) Ducks, (D) Crows, (E) Birds, (F) Reptiles.

A full description, under the heading (B), is given of the specimens of *Davainea fuhrmanni*, n. sp.

Two Further Cases of Cardiac Aneurysm (A. Ingram and J. W. S. Macfie).—Two cases of cardiac aneurysm recently examined at Accra in the Gold Coast, West Africa, the one of the left auricle and the other of the anterior cusp of the mitral valve, are briefly recorded on account of their comparative rarity.

Clinical notes of both cases are fully given by Dr. C. V. LeFanu.

The Experimental Infestation of Physopsis Africana (F. G. Cawston, M.D.Cantab).—This common fresh-water snail was kept alive under artificial conditions in wooden tubs, which contained a few water-plants and an amount of decomposing leaves and small pieces of wood. Nothing was done to prevent the breeding of mosquitoes. The author judges that from five months to one year is necessary to procure examples big enough for experimental purposes.

Some well-developed examples, about 12 mm. in length, were placed in a glass jar containing fresh water. The urine of a bilharzia patient was secured, the ova collected by centrifugalizing the specimen, and these, having been identified as those of *Schistosoma hæmatobium*, were put into the jar containing the snails as soon as the contained miracidia were seen to be ready to hatch. After twenty-four hours the snails were generally placed in a small wooden tub.

It is necessary to wait until cercariæ are escaping into the surrounding water before using them for the experimental infection of animals. It is probably better to keep the infested snails living for several months before dissecting them.

To ascertain whether the experimental infestation has been successful in specimens one does not wish to destroy, it is best to place individual snails in clean test-tubes in a good light, or even break off a minute portion of the shell over the liver.

Among about thirty individuals found infested with schistosomes within one or two months after being exposed to the ova of *S. hæmatobium* and those resembling *S. bovis*, no cercaria have ever been found which show eye-spots, development in rediæ, or possessing the long prongs that some of the schistosomes found in physopsis in the Natal rivers occasionally do. In every instance, when mature, the experimentally produced cercaria in physopsis exposed to infection from the urine of a bilharzia patient was 0·525 mm. in total length, possessed prongs which were about a quarter the length of the tail, and in other respects resembled the cercaria of *S. hæmatobium*.

Notes on Culicidæ in Venezuela, with Descriptions of New Species. Part II. (Alwen M. Evans).—In the consignments of mosquitoes collected from the regions surrounding Caracas and Maracay, some new species of the Arribalzagia group of Anopheles and a very distinctive new species of the Janthinosome group of Psorophora were found.

The detailed anatomy of these rare species is given in this article.

Original Communications.

FRESH-WATER SNAILS RESPONSIBLE FOR THE SPREAD OF BILHARZIA DISEASE IN PORTUGUESE EAST AFRICA.

By F. G. Cawston, M.D.
First Streatfeild Research Scholar.

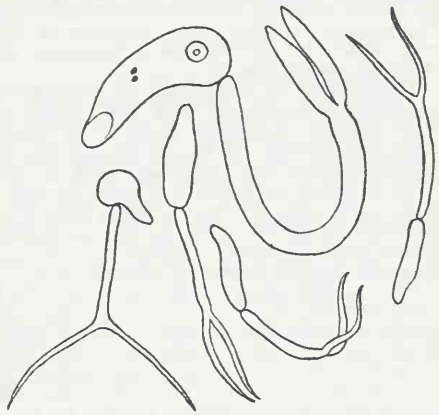
During the twentieth annual meeting of the South African Association for the Advancement of Science, which was held at Lourenço Marques from July 10 to 14, 1922, I took the opportunity of studying some of the fresh-water snails which infest the semi-stagnant pools in the neighbourhood, as well as those pools in the Municipal Gardens, from which water is obtained for a large drinking trough in one of the streets. I also obtained a large number of *Cerithidea*, apparently *decollata*, from the mangrove trees at the side of the smaller bay; whilst some school children from the Rand assisted me in obtaining several hundred marine inhabitants of Delagoa Bay itself.

No cercariæ could be detected in water containing *Cerithidea* or *Lanistes ovum;* but the inhabitants of the water in the Municipal Gardens where the Museum and Zoo are situated were heavily infested with cercariæ, and it is possible that some of them had developed from ova present in manure from the cages of the wild animals and birds. When the ova of *Schistosomum japonicum* from an infested dog are allowed access to water containing *Blandfordia nosophora* it becomes a source of infection to human beings, and it is possible that trematodes infesting wild animals in zoological gardens where fresh-water snails accumulate may occasionally complete their cycle in the human host.

Planorbis pfeifferi was present in large numbers on the water-weeds of the gardens. Some of the examples were amongst the finest I have so far collected. Microscopic examination revealed the presence of schistosomes resembling *Schistosomum mansoni*, which commonly occurs in patients at Lourenço Marques. *P. pfeifferi* is an occasional host for *S. mansoni* in Natal, but infection with this parasite is rare.

Physopsis africana was very abundant, but none were as large as those to be found in the Durban suburbs. Like *Planorbis*, it occurred on the under-surface of water-lily leaves and on other vegetation, as well as on the concrete wall at the side of the garden pools. Some examples were infested with a cercaria 0·7 mm. in total length, which possessed an undivided tail and a rather bulky head; but the greater number of fully mature ones were infested with schistosomes of various kinds, some of which resembled *S. hæmatobium*. A common cercaria in *P. africana*, which also occurred in a snail resembling an *Isidora* in the same pool, was longer and narrower than that of *S. hæmatobium* and may be *S. bovis*. The prongs were equal in length to the tail, being 0·3625 mm. long. Occasionally one came across a schistosome that was over a millimetre in total length, but the majority of fully mature ones were 0·875 mm. No eye-spots were seen. The cercaria was produced in long, whitish sporocysts which branched throughout the liver-substance of the snail. Several infested specimens travelled in fresh water alive to Durban, and the cercariæ have been injected into guinea-pigs, either subcutaneously or intraperitoneally, to secure the adult forms. In Natal *P. africana* has been found infested with *S. hæmatobium*, *S. mansoni* and *S. bovis*.

A much smaller schistosome from *Physopsis* in the Municipal Gardens had flat, fin-like prongs to its divided tail, and its outline resembled the Bilharzia; but it was provided with jet-black eye-spots, which were clearly visible through the transparent walls of the sporocyst in which the cercariæ



Camera lucida sketches of cercariæ from *Physopsis* at Lourenço Marques drawn under a third magnification, the eye-spotted form under a sixth.

developed to their full size. The pair of eye-spots was situated three-fifths the distance from the anterior extremity of the head. The total length of this cercaria, which resembles *Cercaria oculata* of Natal, and may be an avian trematode, is 0·4375 mm., the tail being 0·175 mm., and the prongs 0·07 mm.

Where the columella is ill-defined, it is difficult to differentiate the shell of *P. africana* from that of an *Isidora*. I therefore submitted those shells that were not typical examples of *P. africana*, and were infested with the larger schistosomes from the Zoological Gardens, to Mr. H. C. Burnup of the Natal Museum, who writes:—

"I should refer to them as *Isidora* (?) very like *P. africana*, but with columella strongly plicate anteriorly, rather than truncate. It comes very near the boundary line, but to make a choice, I

should favour *Isidora*. *Physopsis globosa* Morelet has a somewhat similar columella, and I have tried to convince Connolly (who sent me specimens from near Victoria Falls) that it is an *Isidora*, but I don't know if I succeeded."

Similar *Isidora* (?) were present, along with *P. africana*, *Isidora forskali*, *Lanistes ovum* Peters, and possibly two distinct species of *Ancylus*, in the pools near the coconut grove along the Polana beach where many school children were encamped; but only a few examples were obtained, and I had no opportunity of examining them microscopically.

I do not think that the fresh-water inhabitants of this locality have been examined for the presence of cercariæ before this; but the discovery of the intermediary host for *S. hæmatobium*, associated with *Isidora* (*Physa*), from infested areas in Portugal, and the possibility that the disease has recently been introduced into that part of Europe by soldiers returning from service overseas, renders the presence of fluke-infested examples of *Planorbis*, *Isidora* (?) and *Physopsis* in Portuguese East Africa of special interest.

The attention of the Director of Public Health at Lourenço Marques has been drawn to the presence of these fresh-water snails in the gardens where the Museum and Zoo are situated, and the suggestion made that domesticated duck be introduced to control the spread of bilharzia infection in these parts. The presence of these birds is not calculated to interfere seriously with the presence of the quickly breeding "millions" which have been introduced to destroy the mosquito larvæ.

Patients harbouring *Schistosoma* at the Portuguese hospital at Lourenço Marques are being treated by intravenous injections of tartar emetic. Whilst agreeing that it is desirable to use freshly prepared solutions of the drug, Dr. Amaral Leal drew attention to the severe toxic effects which may be produced where the solution is boiled for a long time before being injected, even when an amount equal to only a quarter of a grain of the freshly dissolved powder is employed.

VACCINATION IN THE PHILIPPINE ISLANDS.

By Victor G. Heiser, M.D.,
Consultant in Health to the Governor-General of the Philippine Islands,
and
Charles N. Leach, M.D.,
Manila, P.I.

Recently many publications and statements have been circulated throughout the United States and other countries, alleging that vaccination in the Philippines had not given protection against small-pox. Quotations from annual reports of the Philippine Health Service have been cited by the anti-vaccinationists showing that more than 50,000 deaths from small-pox have occurred in the Philippines during the last few years. The inference is that these deaths have occurred among the vaccinated. The inference is entirely without foundation, as the direct opposite actually occurred. The deaths are recorded almost entirely among the unvaccinated.

It must be recalled that during the Spanish regime, and for some years after the American occupation, more than 40,000 deaths from small-pox occurred annually in the Philippines. When systematic, properly controlled vaccination was instituted the disease disappeared in the wake of the vaccinators. A striking example of this fact is furnished by the mortality statistics for the provinces surrounding Manila. The death-rate from small-pox in these provinces was reduced from 6,000 annually to zero after a thorough campaign of vaccination. In the city of Manila there was not a death from small-pox for seven years prior to 1914. When the vaccination of the entire Philippine population was completed, as far as practicable, instead of 40,000 deaths a year there were only a few hundreds, and these occurred in remote places among persons whom it was impossible to reach with potent lymph. The temperature in the Philippine Islands ranges from 90° to 100° F. nearly the entire year, with the exception of the mountain regions of Northern Luzon. Vaccine under such conditions of temperature would remain potent only a few days after it left the ice. As ice is not obtainable in many sections of the Philippines it was not possible to supply effective lymph; hence many remained unprotected, and among these the disease was kept alive.

After 1914 general vaccination of new-born children and other unprotected persons was not effectively carried out. It is true that the records show that sufficient quantities of vaccine were made and sent out, but it is likewise true that the results of careful investigations instituted recently show that much of the vaccine was never applied, or not used until it had deteriorated. Minor health officers and vaccinators found it much easier simply to report vaccinations than actually to carry out the procedure. Quantities of vaccine virus were actually discovered in waste-paper baskets. In some instances many more vaccinations were reported than would have been possible with the quantity of vaccine sent to the vaccinators. In another instance the total vaccinations reported in Pangasinan exceeded the population by 50,000. Thus, a huge unvaccinated population came into being, and it was only necessary for the ever-present spark to fall among them to start the conflagration. The spark fell, and in consequence more than 50,000 unfortunate victims have lost their lives. It is extremely regrettable that, through the circulation of half-truths in the United States regarding vaccination in the Philippines, a strong effort is being made to influence legislatures to discourage vaccination against small-pox. This can only result in the sacrifice of more lives. When the situation

in the Philippines was finally revealed active vaccination was resumed, and the islands are again almost free of small-pox. Fortunately in recent years methods have been discovered for making vaccine that will remain potent under tropical conditions. Consequently, it is now possible to reach many persons who were inaccessible before.

The Philippines, since 1918, have had one of the greatest small-pox catastrophes of modern times. Fifty thousand people perished. On the basis of population, the islands lost ten times as many lives from small-pox during 1918-1920 as the United States lost from casualties in the World War.

The death roll in the Philippines could have been avoided. The figures conclusively show that 93 per cent. of the deaths occurred among the unvaccinated.

The 7 per cent. that occurred among the successfully vaccinated would probably have been still further reduced if a virulent strain of small-pox had not developed among the unvaccinated, and thus produced an infection which ordinary immunity of the vaccinated was unable to neutralize.

There are many sidelights that confirm the efficacy of vaccination against small-pox in the Philippines. The crews of inter-insular vessels numbering many thousands were regularly vaccinated prior to 1914, and for ten years there was not a single death from small-pox among them. After 1914 the vaccination of new seamen entering the service was not regularly carried out. In 1918 no less than fifteen vessels had small-pox among their crews. Vaccination in the middle of the outbreak in 1918 was vigorously resumed, and no further cases occurred, although small-pox was very prevalent in Manila and ports of call.

The Chinese in the islands number more than 30,000. Owing to the strict registration which is maintained it is comparatively easy to locate them, and they are regularly vaccinated. There was scarcely any small-pox among the Chinese, although it was raging all about them.

Summary.

The recent outbreak of small-pox in the Philippines, in which more than 50,000 persons lost their lives, again confirmed the great value of vaccination as a protective agent against small-pox. The overwhelming evidence, made up of some seven million vaccinations performed prior to 1914, which resulted in bringing small-pox under complete control, has been further supplemented by the outbreak of 1918. In this latter outbreak, 93 per cent. of all deaths from small-pox occurred among those who were unprotected by vaccination.

The deaths among the remaining 7 per cent. were largely due to a virulent strain of infection which probably developed among the unvaccinated.

The records further show that 89 per cent. of the cases of small-pox occurred among unvaccinated children, the majority of whom were born after 1914.

When effective systematic vaccination was resumed in 1918, small-pox again disappeared in the wake of the vaccinators. The disease showed no signs of abating anywhere until vaccination in the stricken areas was again carried out.

Conclusions.

(1) Vaccination is the greatest safeguard against small-pox.

(2) In countries like the Philippines, tremendous catastrophes occur unless the entire population is thoroughly vaccinated against small-pox.

(3) Millions of vaccinations have been made in the Philippines without the loss of life or limb, or any observable effect on health.

(4) In the past, those who have advocated the abolition of vaccination have been the cause of many of the deaths among the unvaccinated. In view of the frightful loss of life that may occur in small-pox epidemics, they are assuming a grave responsibility indeed if they continue their campaign.

Leishmania, Herpetomonas and Crithidia in Fleas (C. Basile, *Parasitology*, vol. xii, No. 4, 1920).—The author reviews his previous work in connection with the transmission of kala-azar by fleas, and discusses the relationship between natural flagellates of insects and leishmania. He shows that a natural insect flagellate passes through a preflagellate, a flagellate and a post-flagellate stage, the latter becoming encysted in the hind-gut and leading to the infection of another insect. The development of leishmania in the flea is traced on these lines and the various stages described. It is suggested that kala-azar is spread not only by inoculations of flagellates by the flea in the act of biting, but by ingestion of the encysted forms passed in the flea's fæces.

The Action of Light on the Leucocyte Count (Janet H. Clark, Ph.D., *American Journal of Hygiene*, vol. i, No. 1, January, 1921).—Direct radiation of rabbits' ears for short periods (one hour) through different filters has shown:—

(1) The region of far ultra-violet (wave length shorter than 300 microns) has practically no effect on the absolute number of polymorphonuclears but produces a very marked lymphocytosis lasting about three weeks.

(2) The near ultra-violet (330 to 390 microns) has a marked depressing effect on the lymphocytes, and, to a less degree, on the polymorphonuclears.

(3) The region between 450 and 650 microns has a stimulating effect on both lymphocytes and polymorphonuclears, particularly on the former.

(4) The wave-lengths longer than 650 microns (the red and infra-red) produce no effect on the blood beyond the drop in lymphocytes, which occurs immediately after exposure to light of any kind.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 2, 1922.

COUÉ AND OTHERS.

THE daily papers have nothing better to do apparently in the slack time but pay close attention to many mentally afflicted persons and parade their "states" of mind and body in full blaze of light, as far as nomenclature, at all events, is concerned. They are popularly put down to "after war conditions." There are, however, other conditions which are brought into notice in which sex plays its passionate and, more curiously still, its *im*passionate part. Women seek divorce from their husbands because their man dares to earn more money than they do. Women declare war upon men for daring to show that they are men and wear beards. Women claim to be able to produce children without men's help, and keep a band of judges or lawyers of sorts discussing the problem of how it is done for days and days in the public law-courts. The members of the medical profession are being given problems that require special "investigators," so-called; and they have to coin names with terminologies which outdo the gibberish of the Kafish-Kafusalem and Abracadabra type. Many of them inhabit streets specially preferred, and their legitimate qualifications are but means to an end, and that end is having to descend to arts to cure the people by pleasing their fads, fancies, longings, "subconscious states," ideals, flights, so that they may do good. The people are threatening to ruin their doctors; they spontaneously create and prepare and develop conditions, mental and physical, and doctors have to be found who will consent to bring themelves to such necromantic states as to gain a hearing by their visitors (or patients, so-called), and thus do their best to lead them back to wisdom.

To-day we cannot escape from this slough, this aura, and incantation of Psycho-analysis of impoverished and often perverted and weak minds, of subconscious states, call it what you will; but it is usually something unnatural, something unclean and unwholesome. The chief sufferer is the doctor, for he is often pulled into an atmosphere that is quite undesired by him, a sphere of unlicensedness—to coin and add yet another to the present-day legends which cloak and smother minds that were once clear as the sun, fair as the moon, but are now the habituées of consulting-rooms, patients whom their mothers used to treat with vulgar castigation, and their "longings" with castor oil, and their doctors with valerian.

Here are two paragraphs from a well-kuown newspaper of to-day:—

"PSYCHO-SECRECY.

"*Doctors and Press Kept out of Congress.*

"*From our own Correspondent.*

"BERLIN.

"The decision of the 7th International Congress on Psycho-analysis, the study of the subconscious mind, which meets to-day in Berliu, to deliberate in camera, has excited much comment.

"The chairman, Professor Sigmund Freud, of Vienna University, who has been a pioneer in this branch of study, has forbidden the admission of even doctors unless they are recognized mental specialists, and the Press, he says, is certainly not wanted.

"Berlin newspapers are annoyed at Professor Freud, and promise to refuse publication to the official report of the proceedings.

*** Psychology is not yet a fully developed science, and the theories of Professor Freud, which have received wide publicity, particularly in the United States, have sometimes proved harmful when applied by insufficiently trained persons, particularly women. Hence no doubt Professor Freud's attitude."

What is this secrecy which even doctors are not considered fit to hear?

In the same column of the paper we read the following:—

"Medical Secrecy.

"Mystery of Man's Death from Salvarsan.

"Dr. R. L. Guthrie, the East London coroner, concluded at the London Hospital yesterday the inquest on a man aged 30, a resident of Stepney, who died in the hospital recently as the result of salvarsan poisoning following treatment given elsewhere.

"It was stated last week that no one—not even the relatives of the man—knew the name of the hospital which he had attended for treatment.

"Dr. Guthrie said yesterday that it had not been possible to trace the hospital the man had attended to receive the salvarsan injections. Clinics where treatment was given were established under the Venereal Diseases Act of 1917, and secrecy was the essence of that Act, to encourage people to go to the hospitals where the clinics existed and receive treatment.

"In law, however, there was no privilege for what a patient told a doctor, and in many divorce cases important evidence had been secured from those clinics. It was, therefore, not a question of 'Should a doctor tell?' but 'The doctor must tell.'

"In the present instance the patient naturally desired to keep his disease secret and quite legitimately. Dr. Guthrie thought in the circumstances, went under an assumed name. Hence it had not been possible to ascertain the hospital he had been attending.

"There being no evidence to show where, how, or by what means the man received the treatment, the coroner recorded an open verdict."

The privacy of the consulting-room is denied. One can imagine that it will not be a long time before the doctor will be called upon and compelled to show the "log" of his practice for public inspection, and when any attempt at smothering the nature of the illness of his patients will be a punishable offence by fine, by imprisonment, or loss of what used to be a valuable record of illness, of signs and symptoms which, grouped scientifically, could be added to the general knowledge of medicine. The writer knows of at least one medical friend of high standing who kept no notes of his cases in order to avoid prying eyes, &c. If called upon to give evidence he can answer, as does the "shady" company promoter, that he keeps no books of his dealings. It may come to this: that the doctor may not even ask his patient's name, and forbid his patient to tell him his (or her) name, the family history, and ask for a prescription to which no name is subscribed. The whole thing is a business transaction imperfectly gauged, and in fifty per cent. of his cases the conclusions are arrived at by an "imperfect" history of the case, and the whole transaction a piece of an imperfect mercantile transaction.

Yet another interference with the practice of medicine is threatened by the clergy demanding that they should revert to the old-time treatment of disease by the members of the Church. That they shall be encouraged to develop a section of the healing art amongst themselves, and that the doctors and the clergy shall draw together "for the common good." On the face of it, it apes the pose of a "sacred" branch of medicine, but one that will corrupt both professions, and lead to interference which must prove provocative. That the approximation and co-operation of the two professions in an ideal union, when carried on by ideal men, is desirable, there can be no doubt, but the clergy demand that they shall take up "religious healing by the soul" as the best way to heal the body. The writer knows of clergy legitimately trained and qualified and licensed in both professions, who do good work in their day and generation. See the medical missionaries throughout the world. These men have spent many years in qualifying themselves for both professions, and for the most part their work is admirable from a professional point of view; and they are, in addition, performing a great service to the Empire, carrying civilization to the utmost parts of the earth. But the proposal by the clergy now is to be professional healers of souls and amateur healers of bodies, a combination which is fraught with danger and much strife and confusion. The subject is too wide to discuss here; it can only be enunciated and its progress watched. We have a few examples of their attempts. The example of Lourdes, promoted by the Roman Catholic Church, is not one to give us a favourable impression; comment upon it is useless, for it is not worthy of serious scientific handling; it is merely an extended version of the many "holy wells" which exist, or did exist, not so long ago in almost every parish and in every country; "wishing wells," whether for husbands or for babies. "Blarney stones" are not confined to Ireland, and the rites performed on "Hallowe'en" in Scotland are but another version of the same. Coué's legend, "Day by day, in every way, I'm getting better and better," is a sample of "cases" when no real disease is present and his clinic is a —— (we shall not honour it by a name nor place in our official "Materia Medica"). Of the patients whom Coué has treated we read was "a had case of nervous trouble" in a man in whom "tremor," "threatening paralysis," &c., were described and were occasionally put in

evidence. At Coué's invitation he rose from his seat and took a few steps across the floor. "Take up thy bed," but this he could always do. Coué treated him by the promise of improvement. "You have been sowing bad seed in your '*unconscious*,' now you will sow good seed"—presumably in his "unconscious." Where that condition or organ resides it is not given to anatomists to know. We have seen such states in drunkards; but yet we look on that state as a disease, and Coué would be legitimately treating in such a case alcoholism as it is dealt with in inebriates' homes, and therefore legitimate practice.

The second patient recorded at the clinic "was an excitable, overworked woman of the artisan class." She described her ailments with voluble minuteness. The sage in terms worthy of Confucius said: "Madame, you think too much about your ailments, and in thinking of them you create fresh ones." We have heard such women describe their ailments. They are generally put down as "the windy spasms," and we know of various pills, such as So-and-So's "coloured" pills, as being effective. It is not stated what Coué did. The next group consisted of a girl with headache, a youth with inflamed eyes, and a farm labourer incapacitated by "varicose veins." Auto-suggestion, said Coué, should bring complete relief. Splendid! We had no idea the veins were under the control of the will. A business man who complained of nervousness, evidently the usual style of City man with aldermanic habits, evidently a man to whom breakfast was abhorrent; but a brandy-and-soda did away with the breakfast habit, the usual cause of adopting such methods of diet.

A neurasthenic came along—a girl—a not uncommon habit of body; an ailment usually dealt with in this country by a "blue pill and black draught." It is impossible to continue this interesting account of Coué's clinic set forth in its second edition by a London publisher.

The object of quoting it at all is to show what the public demand of their doctors. Poor Coué has, by his fellow-citizens in Nancy, where perhaps he followed the legitimate practice of a general practitioner, been brought to dabble in auto-suggestion as a means to pleasing his neighbours, and has boldly come forward with a line of treatment which we hear in this country, and in most other countries, on the village green, or the village square on a Saturday night in the glare of petroleum flares on the back of a travelling van.

We have much sympathy with Emile Coué, although we are not aware, further than he is spoken of as "Dr." Coué, that he holds a French medical qualification. If he does our sympathy is deserved; if that is not the case, he is no more than the "wise women" and the "bone setters" which are found in every parish, in the country and towns of the British Isles, traditional figures as worthy of places amongst the community as were the keepers of the stocks in former days and the night watchmen. J. C.

Annotations.

Leprosy and Demodex Folliculorum (Alberto Serra, *Pathologica*, August 15, 1921).—The author confirms the work of Maiocchi and Borrel, and comes to the conclusion that leprosy is transmitted by the agency of *Demodex folliculorum*.

Observations on a Case of Sodoku (Mario Mantovani, *Pathologica*, August 15, 1921).—The author describes in detail a case of sodoku in an Italian soldier. Fresh and stained preparations of the blood revealed the presence of a few spirillar organisms of a type *Spirochæta morsus muris*. Short and long forms were present. Inoculations into guinea-pigs were successful.

The Influence of Age and Temperature on Bacterial Vaccines (W. F. Harvey, K. R. Iyengar and S. R. Christophers, *Indian Journal of Medical Research*, vol. viii, No. 4, April, 1921).—The authors have come to the conclusion that cholera vaccines do not deteriorate in antigenic potency as judged by agglutinating response within twelve months, or at any temperature to which they are likely to be exposed during that period.

The Preservation of High Titre agglutinating Serum and corresponding Antigen (G. Mackey, *Indian Journal of Medical Research*, vol. viii, No. 4, April, 1921).—Antigen suspensions used for agglutination purposes preserve their agglutinability for a considerable time at ordinary room temperature. Agglutinating antisera lose their potency only at a slow rate when kept at room temperature. A *Micrococcus melitensis* serum loses its potency more rapidly than a *Bacillus paratyphosus* B serum, but agglutinating antisera may lose their potency comparatively slowly when kept at 37° C., as in the case of a *B. paratyphosus* B serum, or rapidly even to complete loss as in the case of a *M. melitensis* serum.

The Value of Quinine Prophylaxis (H. W. Acton, I.M.S., *Indian Journal of Medical Research*, vol. viii, No. 4, April, 1921).—Prophylaxis should be commenced when the minimum wet bulb temperature is approximately between 18° and 22° C., and ended when the temperature for some days exceeds or is lower than this optimum flagellation temperature. The administration of quinine should be continuous, i.e., every day or, at the most, every other day. The dose should be a curative one, i.e., 10 to 15 gr.

If the prophylaxis were carried out on these recommendations there would be no relapses during prophylaxis, and about 50 to 60 per cent. of infections would be prevented. To attain these results quinine prophylaxis would have to be administered during the whole of the malarial season, i.e., seven

months in the year. It should therefore be strictly reserved for troops or labour gangs when on the march or in temporary camps, where permanent preventive measures cannot be installed. Prophylaxis by quinine should be regarded purely as an expedient to keep these individuals fit whilst engaged on some necessary task.

The money yearly spent on quinine as a prophylactic measure could be far better utilized in the installation of fans in barracks. This would markedly decrease the incidence of malaria and add to the general comfort and well-being of troops stationed in India.

The Effects of Platinum Chloride upon some Spirochætes (E. Umemoto, *Tokyo Medical News*, 1920).—The action of platinum chloride on experimental infection in animals has been tested with leptospira of Weil's disease, the spirochæte of rat-bite fever, and the spirochæte of relapsing fever. In the first two cases guinea-pigs were used, and in the third mice. With injections of platinum chloride in doses of an 0·2 per cent. solution in 5 c.c. per kilo of body weight successful results were obtained.

Nature and Systematic Position of Bacillus paratyphosus C (C. F. W. Andrewes and S. Neave, *British Journal of Experimental Pathology*, August, 1921).—During the war a new form of paratyphoid fever was observed. The causal organism, *Bacillus paratyphosus* C, is distinct from *B. paratyphosus* A and B, though presenting relationship to the latter. The authors describe a case of paratyphoid occurring in England. The bacillus isolated was compared with other members of the Salmonella group, and it was found that in cultural and fermentative characters *B. paratyphosus* C differed from *B. paratyphosus* B in its failure to ferment inosite and in its slower rate of alkali production. It differs from *B. suipestifer* in fermenting arabinose and dulcite. *B. paratyphosus* C is shown to belong serologically to Group 1 suipestifers, in spite of the divergence in cultural characters. Different strains of *B. paratyphosus* C vary in their relation to *B. paratyphosus* B. In some the B element is absent, in others it is very obvious.

The Ætiology of Sprue (Trevor Heaton, *Indian Journal of Medical Research*, April, 1920).—The author comes to the conclusion that sprue is a definite entity, and not a mere association of symptoms; its predisposing and complicating factors depending on a single pathological condition. There is no evidence to suggest a specific bacterial or protozoal infection, for though these organisms may be present sprue symptoms can exist without them. These symptoms of sprue are due mainly to mycotic fermentation and digestive incompetence. The peculiarities of the incidence and geographical distribution of this disease point to a physiological rather than an infective cause.

The immediate relief from all infective symptoms in response to non-specific treatment is contrasted with the very slow and uncertain recovery of the digestive function. This is also taken to indicate that the digestive failure is the essential disability, and the infection secondary. The physiological disability of sprue is brought about by the effects of climate.

Malarial Paraplegia (F. Sabatucci, *Policlinico*, February, 1920).—The author describes two cases of spinal paraplegia occurring in patients suffering from malaria in the acute stage. Detailed accounts are given of the question of differential diagnosis, and the author is of the opinion that the underlying cause was myelomalacia of the lower dorsal and upper lumbar spine due to malarial arteritis.

Malarial Hemiplegia in an Infant (L. Spolverini, *Policlinico*, vol. xxvi, No. 51, December, 1921).—A description is given of a case of malarial hemiplegia in a child of eleven months. Starting with an attack of fever after ten hours convulsions set in and lasted for four hours, these left the child drowsy with persistent fever and partial paralysis of the right arm and leg. On admission to hospital the patient showed paralysis of the right facial muscles, pallor, with satisfactory nutrition, enlarged liver and spleen; exaggerated tendon reflexes; Babinski's sign on the right side; lumbar puncture and Widal's reaction gave no help in diagnosis. The examination of the blood showed tertian parasites. Treatment consisted of injections of 30 eg. of hydrochloride of quinine daily.

Helminthiasis and Dysmenorrhœa (G. Leo, *Bulletin de l'Académie de Médecine*, March, 1921).—The author is of the opinion that the presence of worms, especially oxyuris and ascaris, is capable of causing pelvic pain during the menstrual periods. A reliable sign of helminthiasis is the "tongue sign" described by Couillard, characterized by enlargement of the fungiform papillæ of the tongue, which become visible to the naked eye as red spots at the tip or margins of the tongue. When a patient shows the tongue sign and painful dysmenorrhœa at the same time, treatment for worms not only causes reduction or disappearance of the tongue sign but also removes dysmenorrhœa. Should the tongue sign return after recurrence of the parasites and of pain during menstruation is correctly foreshadowed. In some cases the treatment consisted of small enemas of tepid salt water and santonin and calomel by mouth for three or four days, followed by bismuth subcarbonate given internally. Eight women treated in this way for a few months were relieved of their menstrual

distress. In one case, a patient who had had dysmenorrhœa from the age of 14 to 36 years had her first painless menstruation the same month that the anthelminthic treatment was started. Ascaris and many specimens of oxyuris were expelled by this treament. The treatment for worms was constantly effective in cases exhibiting a combination of the tongue sign and dysmenorrhœa.

A Case of Amœbic Dysentery in a Boy aged 3 (M. L. Young, *Lancet*, January, 1921).—The author describes a case of amœbic dysentery in a child of 3, with a history of persistent diarrhœa of six weeks' duration. Dark blood and slime were found in the stools together with numerous dysentery entamœbæ. Treatment consisted of injections of small doses of emetine, a total of $\frac{2}{3}$ gr. being given, with successful results.

Treatment of Chronic Nephritis without Œdema (J. S. McLester, M.D., *Journal of the American Medical Society*, vol. lxxvii, No. 2, 1921).—The patient with chronic nephritis without œdema should be studied as a whole and treated as a whole. He should be permitted a fairly well-balanced low calory diet with small amounts of meat and very little salt; and lastly, his entire life should be so re-ordered as to obtain for him an abundance of rest, some peace of mind, and a fair amount of play.

Effect of Cod-liver Oil administered to Rats with Experimental Rickets (P. G. Shipley, E. V. McCollum, N. Simmonds, and H. T. Parsons, *Journal of Biological Chemistry*, Baltimore, vol. xlv, No 2, January, 1921).—The results of the authors' experiments give evidence of the specific beneficial effect of cod-liver oil on rats suffering with experimental rachitis, in that some substance or substances in the oil cause calcium to be deposited in the same fashion in which deposition occurs in spontaneous healing of rickets in man. Moreover, they prepare the way for the elaboration of a new test for the determination of the calcium-depositing potentiality of any substance in terms of cod-liver oil units. It is interesting to note in these experiments that calcium was deposited in the cartilages following the initiating of the cod-liver oil treatment, in spite of the fact that in some cases the calcium intake was far below normal.

The Diet Factor in Pellagra (W. H. Wilson, M.A., M.D., *Journal of Hygiene*, vol. xx, No. 1, July, 1921).—The author comes to the conclusion that pellagra is the ultimate result of a deficient supply of protein. The sufficiency or insufficiency must be judged by the biological value of the protein, estimated on the amount available for assimilation and not on the gross protein; 40 may be taken as the minimum safe value for this factor. Below this cases are likely to occur in the affected community; owing, however, to the great normal variations in the minimum protein requirement, many individuals, the biological value of whose daily protein intake is as low as 20, will escape the disease, while it is possible that some, with a value below 40, may become affected.

Bence-Jones Proteinuria (Waltman Walters, M.D., *Journal of the American Medical Association*, vol. lxxvi, No. 10, March, 1921).—A large quantity of albumin in otherwise negative urine in a patient with normal renal function and normal blood pressure and a marked secondary anæmia should suggest the possibility of Bence-Jones proteinuria, especially when bone lesions are present.

Bence-Jones proteinuria is significant from a diagnostic and from a prognostic standpoint of multiple myeloma, since it occurs in 80 per cent. of all cases, and is usually followed by death within two years.

The quantity of Bence-Jones protein excreted is independent of the protein intake, evidenced by an approximately constant excretion for three-hour periods, irrespective of changes in diet. The amount of Bence-Jones protein excreted during the night when food is not taken is only slightly less than the amount excreted during the day. There is not a constant relationship between the quantity of Bence-Jones protein and the total urinary nitrogen excreted.

As the finding of Bence-Jones protein in the urine led to its detection in the blood, it may be possible that other proteins of a similar or dissimilar nature are in existence in the blood and are not excreted by the kidneys.

Erythrœdema (A. J. Wood, *Medical Journal of Australia*, February, 1921).—The author claims that this disease is not a rare one; he has notes of forty cases and has heard of fifty-one others. The symptoms are most characteristic when well developed. The child holds the head bent down; usually it is whining and fretful. Some patients do not seem able to rest, scratching at their hair, ears, or feet. In some cases the red swollen appearance of the hands is an early symptom, and if present is absolutely pathognomonic of erythrœdema. The little patients are worn out for want of sleep, and are in absolute distress on account of the intolerable irritation. The earliest symptom in young infants seems to be the continual fretfulness and inability to sleep and disinclination for food. A little later, it may be two or three weeks or as late as four or five months after the onset of the fretfulness, that the redness of the hands and feet appears. Wasting is an early symptom and the muscles become soft and weak. The neck muscles do not seem to support the head properly, and in older infants the power of sitting up or walking is lost early in the disease.

Stomatitis is a frequent symptom. The redness of the hands and feet, accompanied by an icy coldness to touch, is the most characteristic feature of the disease, and in some cases the loss of fingers and toe-nails is by no means rare. When the rash is marked it is common to find the glands in the axillæ and groins enlarged. The rectal temperature is generally about 37·8° C. The prognosis is good; the majority of the patients get quite well. The treatment is wholly symptomatic.

Communal Activity of Bacteria (J. W. Churchman, M.D., and Morton C. Kahn, *Journal of Experimental Medicine*, vol. xxxiii, No. 5, May 1, 1921).—The behaviour of a single bacterial cell towards gentian violet differs fundamentally from that of a small group of cells (thirty). The explanation of this phenomenon is not purely quantitative; thirty cells accomplish much more than thirty times what one cell can accomplish.

Abnormal Forms of Diphtheria (H. Darre, *Bulletin Médical*, Paris, March, 1921).—The author discusses the simple catarrhal form of sore throat without membranes, but for which the diphtheria bacilli are responsible; every sore throat is suspicious when diphtheria is about. Another perplexing form is when the diphtheria attacks the adenoids first. The extreme pallor, small pulse and other signs of severe intoxication should give the alarm, for the diphtheria toxin is absorbed with extraordinary rapidity from adenoiditis. Another type described simulates follicular tonsillitis, or there may be a form suggesting herpes. The most deceptive form is when there is violent pain in the neck, trismus, and the aspect of the pharynx suggests a phlegmon around the tonsil.

The Turkey an Important Factor in the Spread of Gapeworms (B. H. Ransom, *United States Department of Agriculture, Bulletin* No. 939).—The turkey is probably the natural host of the gapeworm. Adult turkeys as well as young turkeys commonly harbour gapeworms, though they may show no symptoms of infestation. The bird is apparently the chief agent in the spread of gapeworm to new localities, and is probably the principal source of infection to the soil on poultry farms where gapes is prevalent, as gapes appears to be more common on farms where turkeys frequent the chicken runs than on those where there are no turkeys at all.

Chickens, unlike turkeys, are readily susceptible to infection with gapeworms only when they are young. They become less susceptible as they get older. In those cases where gapeworms develop in adult chickens the parasites are likely to live only a short time.

Ground contaminated by gapeworms is likely to remain infective.

Losses from gapes can be greatly reduced, if not altogether avoided, by keeping young chickens on ground that has not been exposed to contamination within at least a year, and that is protected from further contamination by excluding turkeys from it during its occupancy by the chickens. As gapeworms appear rarely to occur in adult chickens, brood hens may be associated with the young chickens with probably little risk of infection to the latter from that source. The simplest means of preventing or reducing losses from gapes appears to be the exclusion of turkeys from farms where chickens are raised.

Further Studies on the Behaviour of Bacteria towards Gentian Violet (J. W. Churchman, M.D., *Journal of Experimental Medicine*, vol. xxxiii, No. 5, May 1, 1921).—A gentian-positive strain (a " strain-within-a-strain " variant) was isolated from a pure culture of a gentian-negative organism. This observation corresponds to that of a " strain-within-a-species " variant, occurring in the enteritidis group, reported some years ago.

The Gram reaction and the gentian reaction do not depend, as has been assumed in previous publications, on the specific affinity of the gentian-positive organisms for a portion of the gentian-violet molecule, since certain Gram-negative strains are shown to be gentian-positive.

Dead bacterial bodies interposed between living bacteria and gentian-violet media partially negative the effect of the dye on Gram-positive organisms and allow them to grow. This seems to be either a phenomenon of filtration or of stimulation of growth.

The application of these facts by the method of divided plates shows a number of difficulties in the application of laboratory studies to chemotherapeutics, which would escape observation by ordinary methods.

Ætiologic Relation of Worms to Epilepsy (E. B. Block, *Georgia Medical Association Journal*, March, 1921).—The author feels justified in saying that there is reason to believe that epilepsy when produced by animal parasites may be due to the actual brain invasion by the larvæ. The absence of worms or eggs in the stools is not proof of the absence of parasites in other parts of the body. Out of 100 cases of epilepsy in which stools were examined, fifty-six were negative, twenty-one showed ascaris, seventeen hookworm, four oxyuris, one *Tænia* (hymenolepis) *nana*, and one *T. saginata*. This shows that 44 per cent. of the epilepsy cases have worms. In seventeen cases the worms or eggs were present on examination at the time of consultation, while in twenty-seven cases they had been found previously in laboratory examination or had been seen by the patients and accurately described. Most of the ascaris cases belonged to this latter group. The work done by the Rocke-

feller Sanitary Commission showed that out of a total of 35,133 examinations, 11,418 people showed intestinal parasites (32·49 per cent.). As part of these were double infections, a total of 11,985 worms were found.

Relations between Catarrhal Colds and Tuberculosis (Warnecke, *Zeitschrift für Tuberkulose*, February, 1921).—The author explains how recurring catarrhal colds are liable to prepare the mucous membranes and lymph glands for tuberculosis, or rouse a latent into an active tuberculous process, or transform a closed into an open case. It must be borne in mind that the tuberculous are peculiarly sensitive to "catching cold," both on account of their constitutional inferiority and of the frequent toxic action of the disease on the nervous apparatus.

Coccidoidal Granuloma (K. E. Lynch, *Southern Medical Journal*, vol. xiii, No. 4, April, 1920).—The author describes a case of a coloured woman who died in hospital under the diagnosis of pulmonary tuberculosis. From the examination of sections of organs obtained at the necropsy a parasite was found similar to Rixford and Gilchrist's *Coccidoides immitis*. This parasite was found also in the spleen, liver, lungs, pancreas and kidneys, but no cultures of the organism were grown.

Some Deficiency Diseases and Leprosy (A. S. Dutton, *Proceedings of the Royal Society of Medicine*, April, 1920).—The author describes beriberi and scurvy as deficiency diseases and then passes on to leprosy, the nervous symptoms of which he considers closely resemble those of beriberi, also there are a few similarities in the geographical distribution. The author does not hold that leprosy is caused by the taking in of bacilli from eating fish, but that when only fish is eaten there is an important deficiency in some element of diet. Possibly the fish is affected by salting, and it is noted that no fish except shellfish contain carbohydrates.

A Case of Malaria infected in the Riverina, New South Wales (H. J. Clayton, *Medical Journal of Australia*, May, 1921).—The author reports what he considers to be the first autochthonous case of malaria in Australia, south of Sydney. The patient's condition became grave, with rigors, vomiting, coma-vigil and dilated heart, the lungs fortunately remaining clear. On examination of the blood a heavy tertian infection was discovered. It was thought that the infection was caught from a neighbour who had suffered from malaria; also the ground round the patient's house proved on inquiry to be of a swampy nature. Treatment consisted of quinine given intravenously at first on account of hyperemesis; later it was given orally with intramuscular injections of novarsenobillon.

Abstracts and Reprints.

GENERAL RECOMMENDATIONS CONCERNING SANITATION AND PREVENTION OF DISEASE IN THE TROPICS.[1]

Preparation.

Before going to the tropics for continued residence, one should see that he is in good condition. The teeth and eyes in particular should be thoroughly examined and any necessary work done before leaving home. If one is dependent upon eye-glasses, it is advisable to take along an extra pair. If the eyes are sensitive to light, a pair of slightly coloured or smoked glasses is desirable, as the glare of the sunlight in the tropics is rather trying to some people.

Vaccination against small-pox and inoculation against typhoid are strongly recommended.

Location.

A suitable site is the first consideration when continued residence in the tropics is anticipated. A location should be selected as far as practicable from any swampy or mosquito-breeding district, as it is now well known that the Anopheles mosquito, responsible for the transmission of malaria, will fly at least one mile in search of warm blood which is essential for the maturation of eggs.

Sanitation.

The site selected should be cleared of all shrubbery with the exception of a limited number of shade trees, for a distance of at least one hundred yards in every direction from the proposed dwelling. Over this area the short vegetation should be cut from three to six times a year, depending upon the luxuriance of the growth.

A careful survey should be made in all directions from the building site for possible mosquito-breeding places. Wherever possible, standing water pools should be drained off, filled seepage areas taken care of by subsoil drainage, and all unnecessary water-containers, such as bottles and cans, buried or destroyed. Bodies of water which cannot be eliminated by one of the above methods should be treated with crude oil, Paris green, or some good larvacide. Paris green, in the proportion of 1 per cent., may be mixed with common road dust, and thrown by hand over the areas infested with mosquitoes, the operator standing to the windward side and relying on the wind to disseminate the mixture. It has been found that about two tablespoonfuls of Paris green, mixed with about 25 oz. of road dust, are sufficient to give 100 per cent. efficient control of 1,000 square feet of surface at a cost of a fraction of a cent. The application of a larvacide must be repeated at intervals of from one to two weeks.

Type of Building.

A house suitable for the tropics must be of such a character as to afford free ventilation night and

[1] Abstracted from the Tenth Annual Report of the Medical Department of the United Fruit Company, 1921.

day, and it has been found that a ceiling height of at least 11 ft. is necessary. When a permanent structure is desired, it is better to build of concrete or masonry, but if a temporary structure only is required, wood is cheaper and quite suitable. The roof should have an overhang of 3 ft. or more.

A cool house is desirable, and to that end, if built of concrete or masonry, the thickness of the walls should be sufficient to prevent heating through by the sun's rays during the day. If the building is of wood, the walls should be double boarded, i.e., sheathed within and boarded without, unless protected by verandas. If thin walls are constructed they should be protected by an increased overhang of roof or permanent awnings. All buildings, regardless of materials used, should have ceilings in all the rooms. It is a good practice to have a screened space directly underneath the ceiling, in the side walls, for ventilation.

The building, unless of concrete or masonry, should be elevated 3 ft. from the ground on pillars of concrete or masonry. By placing gutters constantly filled with crude oil or creosote around the pillars and ground plumbing connections and by leaving a space of 1 in. between the porch steps and the building, the latter can be absolutely protected from ants. Such protection is necessary, particularly from wood ants, which can destroy in a comparatively short space of time any wooden building to which they obtain access.

Screening is of great importance. Buildings should be so constructed as to permit all living rooms and porches to be completely and effectively screened. Permanent screening in the tropics should consist of copper wire 98 per cent. to 99 per cent. pure, with not more than ½ per cent. iron, or of monel-metal wire. Other classes of screening do not last sufficiently long to justify the expense of putting them on, as they corrode or deteriorate rapidly. This applies particularly to the screening of buildings located near the salt water. Screens should have at least eighteen moshes to the inch, as otherwise they will not exclude mosquitoes.

Great economy can be exercised in screening verandas if solid construction—masonry or wood—is extended about 3 ft. upward from the floor and 1 or 2 ft. downward from the ceiling, thus leaving a space of about 5 or 6 ft. in height to be screened. This plan allows sufficient air and ventilation, affords a certain amount of privacy, and excludes the bright glare of the sun, which at times is very annoying.

All windows not opening on the verandas should be screened, and the screening itself should be flush with the outside of the house and immovable. All weather protection, such as windows and blinds, should be inside the screening. On the whole, French or louvred windows are preferable to the ordinary slide windows. All outside doors should be protected by porches to admit of double screening, and screen doors should open outward.

Should a house be built according to these directions, the possibility of its infestation by mosquitoes or other insects is reduced to a minimum.

Sewage.

This can be cared for by a septic tank in or near the house, with a capacity of 100 gallons to each six individuals, with a supplementary tank of 50 gallons capacity to take care of the overflow from the main tank. The overflow may be run into any garden plot, gravel or sandy soil.

In most cases all that is necessary is a properly constructed outside or pit closet. The pit should be at least 5 ft. deep, and, if the soil is liable to cave in, the pit should be lined with wood or cement. It should, furthermore, be suitably boxed in at the top to exclude flies, and the seat should be provided with a self-closing lid which will afford protection against flies and other insects. Either bleaching powder, borax or dry earth, in small quantities, should be added from time to time. When the pit has become filled to within 2 ft. of the surface, it should be either cleaned out or filled up and a fresh pit dug. The building of bucket latrines should not be encouraged.

Water.

Wholesome drinking water is of the greatest importance, because water may be contaminated with the germs of typhoid, cholera or dysentery.

In some districts a well sunk at small cost will give ample supply of water which is safe, provided essential precautions have been observed.

Firstly, there should be no privy, cesspool or other source of contamination of the ground water within 100 yards of the well or situated at a level higher than the well in the same neighbourhood.

Secondly, dug wells must be protected from surface contamination by keeping the ground around them clean, by sheathing the inside of the well in such a way that its walls shall be watertight for a distance of 10 ft. below the surface, by carrying this sheathing upward above the surface of the ground for 18 in., by building around it a watertight shield of concrete extending outward in a circle for 3 or 4 ft., by covering the well with a watertight flooring, into which the pump is securely fastened in such a way that there can be no leakage or backflow into the well, and providing a trough which will carry waste water to a distance of 12 ft. from the well. Ventilation of wells is unnecessary.

The top of a driven well must be as carefully protected as that of a dug well, otherwise seepage of surface water or backflow into the well along the pipe may contaminate the supply. If a well is not practicable rain water may be used, and should be collected in covered tanks or barrels. The covers of these containers should be raised at least 6 in. to permit of proper aeration of the water in order to keep it fresh. This space should be screened to exclude mosquitoes.

If neither safe well water nor rain water is available, water from running streams, large ponds or lakes may be used, but since it is possible that such water may contain the organisms of tropical dysentery even when there is no apparent source of pollution, it is essential that such water should be boiled for five minutes or disinfected before being

used for drinking. After boiling, the water can be cooled in an unglazed earthenware vessel or in a "desert water-bag."

Disinfection of water can be satisfactorily accomplished by the use of chlorinated lime (bleaching powder), but since this substance deteriorates on exposure to air or light, it should be kept in an air-tight tin or well-stoppered bottle in a dark place. Under these conditions it keeps fairly well. From this supply a stock solution should be prepared once in six days and kept in a tightly stoppered coloured bottle. The stock solution is made by dissolving half a level teaspoonful of lime in a pint of water. Of this solution use one teaspoonful to two gallons of water, thirty-six drops to one gallon, or nine drops to one quart, and let the water stand half an hour before using it.

Food.

This is important. If a man is doing hard physical work he is able to assimilate almost any class of food, but if he is living a sedentery life and not expending much energy, he should eat freely of green vegetables and fresh fruits, and should restrict his use of starchy or sweet foods and of meats. In all circumstances, however, a well-balanced diet is desirable, as scurvy and beriberi are now attributable to the failure to secure a full nutritious diet. Pellagra is probably due to the same cause.

Great care must be taken to protect all food from contact with flies and other insects, as this is one of the most common sources of typhoid, dysentery and other infections. Uncooked fresh vegetables should be thoroughly washed before being eaten, and fresh fruit should be peeled. Food should not be handled by anyone suffering from a contagious or infectious disease.

It is essential that milk be secured from a reliable source and kept free from infection. Unless this can be done it is always advisable to boil it before using it. Diphtheria, typhoid, tuberculosis and other diseases may be contracted if this precaution is not observed.

The newcomer in the tropics should learn to use native vegetables and fruit, which grow abundantly, and are equal from the standpoint of nutrition to those grown in northern latitudes, which are generally difficult to procure and, when imported, are not as fresh as those grown locally.

While certain canned vegetables and fruits may be used to supplement the diet, they should not be eaten extensively.

It is a good general rule of life in the tropics to eat moderately and to avoid chilling the stomach by excessive use of ice water or other iced liquids.

Clothing.

It is better to wear very light cotton underwear, as all-wool and wool combinations tend to irritate the skin and cause prickly heat. Owing to excessive perspiration, underwear should be very frequently changed. The outer garments may consist of khaki, white duck or a very loosely woven unlined woollen garment of light colour and weight. Should one's duties require him to go into uncultivated and insanitary districts, high leather boots or boots with leather puttees should be worn to avoid the possibility of infection from the larvæ of hookworm, which lurk in dark and damp places, and from chiggers or red bugs. They will also afford protection from the bites of mosquitoes, some varieties of which are prone to attack the ankles, and from the bites of snakes, which are occasionally met with, particularly in frontier work.

If one's duties require continuous exposure to the sun's rays, a well-ventilated, light-coloured helmet affords comfortable protection. Sunstroke, however, is unknown in the tropical countries where the United Fruit Company operates.

Whenever possible, wet clothing should be promptly changed to prevent chill, which is always to be avoided in the tropics, as it is apt to bring out latent malaria or cause an attack of diarrhœa.

Bathing.

The excretions and secretions of the skin in a tropical climate are abundant and prone to decomposition, causing irritation of the skin and rendering it susceptible to bacterial infection. Hence daily bathing is strongly recommended.

In parts of the West Indies bilharziosis is prevalent. The disease is due to a parasite, the embryo of which inhabits water from which it penetrates the skin of man and produces disease of the bladder or bowels. Wherever bilharziosis prevails it is dangerous to allow the water of ponds or streams to come in contact with the skin or to drink such water. Good well water or rain water is safe, and water from other sources may be rendered safe for washing purposes by storing it for three days, during which time the parasite dies, or the water may be boiled.

General.

While it is always essential in any climate to keep the bowels open, care in this respect is particularly important in the tropics. Care of the teeth for cleanliness and preservation is essential in all warm climates.

Alcoholic drinks in the tropics should be used sparingly, if at all; when used to excess they tend to lower resistance to disease. Regular exercise is exceedingly important for the maintenance of health.

As cockroaches and other insects are prevalent in the tropics, it is of great importance to keep the house clean throughout at all times, and articles of clothing, as well as travelling bags, &c., should be carefully examined before being used.

Owing to the excessive humidity in the tropics, particularly adjacent to the sea-coast, there is a tendency for articles quickly to become mouldy. It is essential to give one's clothing, bedding, and other personal effects a sun-bath, so to speak, at frequent intervals.

Tropical Diseases.

Diseases peculiar to the tropics are conveyed mainly by insects or through drinking water or

food contaminated with human excreta. With protection from insects, a supply of good drinking water, wholesome food and efficient disposal of sewage, one is practically assured of immunity from most of these diseases.

The most prevalent diseases in the tropics are malaria and hookworm.

Diseases due to the bites of insects:—

From mosquitoes: Malaria, yellow fever, dengue, phlebotomus fever and filariasis.

From fleas: Plague.

From flies: Oriental sore and screw worm.

From lice: Typhus fever and relapsing fever.

From ticks: Relapsing fever.

However, almost any insect, especially flies, may contaminate food with the germs of typhoid, cholera, dysentery, infantile diarrhœa, tuberculosis and other diseases through the mechanical action of conveying the infectious bacteria on their bodies.

Mosquitoes.

While it is important to determine the species of mosquitoes with which we have to deal, since it is difficult to recognize those which communicate disease, it is best to wage warfare on all the species to be certain of destroying those which convey disease.

It is well known that malaria is communicated by a few species of Anopheles, yellow fever by Stegomyia or *Aedes calopus*, and that different species of the Culex are concerned in transmitting other fevers referred to above.

There are four stages in the development of the mosquito—the egg, the larva, the pupa and the imago or adult insect. All mosquitoes deposit their eggs in water, and it takes from twelve hours to three days, depending upon the temperature of the water, for the eggs to hatch into the larval form. Growth takes place in the larval stage, during which it moults three or four times. In from three to eight days the larva becomes a pupa, in which stage the head is enormously large compared with the rest of the body. In the pupal or resting stage feeding ceases, and the pupa lies most of the time on the surface of the water. It remains in the pupa stage from two to four days, when it develops into the mature mosquito.

Seven to ten days from the time the egg is deposited are required for the development of the full-grown mosquito. In general the Stegomyia develops more quickly than in the Anopheles or Culex. It is of interest to note that in almost all species of mosquitoes the female alone seeks the blood of warm-blooded animals. The male mosquito usually lives upon the juices of flowers and plants.

The different genera can be readily distinguished in three of the four stages, namely, the egg, the larva and at maturity, i.e., the adult or flying stage.

In the egg stage they can be differentiated by the shape of the eggs and the manner in which they are deposited. The eggs of the Anopheles are generally laid singly, in geometrical designs; the Culex in boat-shaped masses, closely cemented together in a vertical direction; while the Stegomyia lay their eggs singly, more or less separated, without any special form or design. Under the microscope the eggs of the different species can be readily detected.

In the larval stage the Anopheles assume a horizontal position close to the surface of the water; the Culex and the Stegomyia are suspended from their breathing tube at an angle to the surface of the water, with the head dependent. The Stegomyia, however, is longer than the Culex in the larval stage, is more easily disturbed, and has an air-tube which is much thicker and shorter. In the larval stage all mosquitoes are air-breathers, and spend most of the time on the surface of the water with their respiratory openings, or breathing tubes, projected in the air or near the surface of the water.

In the adult stage, when resting, the Anopheles always assumes an attitude at an angle to the surface upon which it rests, whereas the Culex and Stegomyia have their bodies more or less parallel to the surface. The wings of the Anopheles mosquito are spotted or dappled; the Culex has a greyish appearance; while the Stegomyia or "Tiger" mosquito is distinguished by its dark body, with white stripes arranged on the thorax so as to give it the appearance of a jew's-harp. Its legs are similarly banded.

Fleas.

Plague is primarily a disease of rats and other rodents, and is transmitted by rat-fleas to man. In order to prevent plague, therefore, every effort should be made in each locality to destroy rats and their parasites, fleas.

Rats should be deprived of food by rat-proofing warehouses and other places where food is stored and by covering and destroying garbage. Furthermore, rats should be poisoned or trapped or killed through the use of cats and dogs.

All types of fleas may be destroyed by naphthalene flakes scattered generously over the floors of infested buildings.

House-flies as Carriers of Disease.

The importance of the common house-fly as a carrier of disease cannot be too carefully considered. The female lays her eggs in manure, preferably in horse manure, but decaying vegetable matter, meat or any other organic material serves equally well.

The eggs are white and elongated, measuring about 1/25th of an inch in length. They are irregularly deposited in clusters of from 120 to 150 by a single fly, and she may deposit as many as four batches during the summer. The eggs hatch in from eight to twenty-four hours. A newly-hatched larva, or maggot, is about 1/12th of an inch in length. It grows rapidly, and after three moults reaches maturity in about a week, when it becomes a pupa. The pupal, or resting stage, is completed in from three to six days. It takes from

ten to twenty days (depending upon weather conditions) from the time the egg is hatched for the fly to reach the adult stage; in about ten days more the young female is ready to deposit eggs. It is readily seen, therefore, how prolific flies are.

In their methods of feeding flies cannot take in any solid substances, and before feeding they vomit the contents of their stomachs with their bacteria over the food they are ready to feed upon. Fly specks, so commonly observed, are for the most part this ejected matter; fly fæces also produce or leave specks, but they are few in number compared with the vomit specks. When flies feed upon excreta or matter of any kind containing disease germs, and subsequently fly to food, they readily contaminate it, and in this way communicate disease. Flies fed upon colonies of typhoid bacilli not only communicate it through their vomiting, but the germs passing into their stomachs are excreted by them in a viable condition. It is known that for forty-eight hours after they have fed upon colonies of typhoid organisms they are able to communicate the disease through their fæces. Not only typhoid, but dysentery, yaws, infantile diarrhœa, cholera and tuberculosis can be spread in a similar manner. The importance of preventing as far as possible the breeding of flies as well as their access to all food, milk and drinking water can be readily seen.

It has been clearly demonstrated on the Canal Zone that murrain, a trypanosome disease of horses and mules, can be transmitted by the house-fly, which feeds upon excoriated patches of diseased animals, and transmits the disease to cuts and galls of healthy animals.

As stated above, flies breed in manure, garbage and decaying organic matter of all kinds, or in soil contaminated with dish water, and one of the best ways to destroy their eggs is by the application of borax. The proportion of about one pound to twelve bushels or 15 cubic feet of refuse pile is recommended. Wherever possible, in connection with stables, the manure should be kept in retainers and treated with borax before being carted away for fertilizing purposes. It is practically impossible to prevent entirely the breeding of flies, but reasonable and inexpensive methods will go a long way to abate the nuisance.

The stable-fly closely resembles the house-fly in appearance, but its habits and methods of feeding are somewhat different, inasmuch as it is able to bite through or into the skin of man or animal. The methods of destruction of the house-fly are applicable to the stable-fly also, but the latter does not frequent malodorous places as much as the house-fly, and is therefore less liable to carry typhoid fever germs. The stable-fly, however, has been known to transmit anthrax.

The large black horse-fly can transmit anthrax by biting an infected animal and then biting a healthy animal. This large fly lays its eggs on blades of grass growing in swampy districts, and not in manure, as do the house- or stable-flies.

Sand-flies.

So far as is known, sand-flies breed in water (salt or fresh) or in moist sand in which there is decaying vegetable matter. Mangrove swamps are well suited for this purpose. Cutting down the growth and draining and filling the swamp so as to have about a quarter of a mile properly sanitated between the growing swamp and the residential section give satisfactory results, as that distance is about the limit of flight.

Lice.

There are three varieties of lice: the body, head and pubic, the first two of which may convey typhus and relapsing fever. The body louse, *Pediculus vestimenti*, lives usually in the clothing, and may be destroyed by boiling or baking. Naphthalene powder or ointment may be used as a prophylactic. The head louse, *Pediculus capitis*, is destroyed by washing the hair with equal parts of kerosene and vinegar, or by emulsion of gasolene. Several applications, at two- or three-day intervals, may be necessary, as the eggs are hard to kill. Tincture of larkspur is also highly recommended. In any case, the treatment should be applied at night and the head wrapped in a towel and washed in the morning. The Phthirius, pubic or crab louse, can best be destroyed by the use of mercury ointment, which should be of known strength and used according to the physician's instructions.

Ticks.

Ticks, which may convey relapsing fever, should be removed from the skin by an application of ammonia, chloroform, kerosene or turpentine. If carelessly pulled off, the head may be torn from the body, and remaining in the skin, set up considerable irritation.

Chiggers or Red Bugs.

Chiggers or red bugs frequently constitute nuisances in certain parts of Central America and the West Indies. The parasite thrives in dry fields and sandy places, and breeds particularly in dirty native huts. This insect—both the male and female—is reddish brown, about 1 mm. in length, and is very active. It lives by sucking the blood of man and warm-blooded animals. When impregnated, the female burrows into the skin, particularly about the feet, the toes and under the nails, but also in the anus, scrotum and sometimes on the face. On inspection, a small, dark red spot is seen on the skin. After entering the skin, the abdomen of the insect often swells enormously in size, sometimes to the size of a small pea. The eggs which the female lays are expelled through an opening where she entered the skin, and the female chigger also escapes later by producing ulceration. The insect causes irritation, itching, pus formation and ulceration. For prophylaxis, the feet and legs should be well protected, and after a day in the open the skin should be examined to see that no insects are present. Treatment consists of careful

removal of the insect with a clean needle and by rubbing carbolic ointment into the resulting abrasions.

Roaches.

For the destruction of roaches, powdered sodium fluoride, distributed on the floors near the walls and on the shelves in closets, is strongly recommended.

Ants.

A mop, moistened with kerosene, or kerosene mixed with crude oil, applied to the floors once a week, is an efficient agent against ants.

Prophylaxis for Malaria.

Malaria is the most prevalent tropical disease, and to it is due the majority of cases of fever which develop in tropical countries. Quinine should always be carried if one is travelling any distance from a source of supply. If one is reasonably certain of being exposed to the bites of infected mosquitoes, he should take at least 15 gr. every three or four days. In case fever develops, a preliminary dose of 3 gr. of calomel, followed in four or five hours by magnesium sulphate, should be taken. Within an hour or two after taking the calomel, one should take 10 to 15 gr. of quinine—preferably in solution—and continue to do so every four to six hours until the temperature drops, and then take 10 to 15 gr. three times a day for two weeks subsequently. It is good practice thereafter to take 30 gr., in two doses—every Saturday and Sunday—for eight weeks.

If the temperature does not yield to the treatment suggested above, some other underlying cause probably exists, and hospital treatment should be sought as soon as possible, as in pernicious cases hypodermic or intravenous injections may be necessary. In every case of fever the services of a physician should be sought as soon as possible. Quinine prophylaxis is very important in frontier camps before other methods of protection can be put into operation.

Hookworm.

Hookworm is a disease resulting from the presence in the intestines of large numbers of worms called Uncinaria or Ankylostoma. This disease is the cause of much of the anæmia and ill-health in tropical and sub-tropical countries.

While it is not frequently the direct cause of death, indirectly it is often an important factor in the mortality rate, as it reduces the resistance of the patient to such an extent that he readily succumbs to some infection which of itself might not prove serious.

Infection by hookworm may occur in two ways, namely, by mouth or through the skin. The initial lesion where the embryos of the worm have penetrated the skin is called "Ground Itch."

Infection can be avoided by (*a*) providing a safe means for the disposal of human excreta to avoid pollution of the soil; (*b*) refraining from the habit of going barefoot (as is the custom of natives in many tropical localities; (*c*) avoiding as much as possible the handling of infected earth; and (*d*) never eating unpeeled fruit or vegetables not thoroughly cleansed.

Snake-bite.

If an individual has been bitten by a poisonous snake, the bitten limb should immediately be surrounded by a tightly drawn bandage or handkerchief, as close to the bite as possible and between the trunk and the wound. The wound made by the fangs should then be freely incised with a clean knife and sucked. There is no danger in sucking the wound if there are no cracks or sores in the mouth or on the tongue. The wound should not be cauterized. The bitten person should be promptly removed to the nearest dispensary or hospital and given anti-venomous serum, and the case treated according to the special symptoms which may develop.

Venereal Diseases.

These diseases are prevalent throughout the tropics in all forms and in great virulence. They are frequently contracted while under the influence of alcohol, when the sense of responsibility for one's acts is dulled and all sorts of chances taken. They have been responsible for the ruination of many young men who do not know the far-reaching results of infection, and who fail to realize that the contraction of a venereal disease in any form may be directly responsible for the early death of the individual, or may bring about physical conditions which impair his usefulness throughout life.

Should an individual expose himself he should immediately seek a doctor for prophylaetic treatment. If he contracts a venereal disease, the sooner he seeks the advice of a competent physician the less serious will be the results.

The United States Navy has issued instructions to its medical officers, recommending certain prophylactic measures, which are as follows:—

"(1) Thoroughly wash the penis with soap and water.

"(2) Instruct the man to pass urine before taking prophylactic treatment.

"(3) Inject 2 per cent. protargol solution (or 10 per cent. argyrol or 10 per cent. silvol) into anterior urethra with syringe and hold meatus for five minutes. (About one-half fluid ounce of solution is used.)

"(4) Thoroughly apply a liberal amount of calomel ointment (30 per cent. calomel powder by weight in adeps lanæ hydrous) to penis and scrotum.

"(5) Instruct the man not to wash or wipe the ointment off for several hours.

"Such treatment is very efficacious in preventing the development of venereal disease infections if given within the first hour after exposure. Its value rapidly diminishes from then on, and when eight hours have elapsed since the exposure its value is greatly reduced. It should, however, be given up to at least twelve hours after exposure.

"The first measure, at least, should be taken immediately by the person exposed."

CONCLUSION.

The success attained in certain tropical localities in sanitation, community health and greater freedom from the so-called tropical diseases, many of which are not uncommon in the temperate zones, has been largely due to reasonable precautions taken by the individual. In tropical countries, even more than elsewhere, all should feel a sense of mutual obligation.

By following these general recommendations, a task neither onerous nor difficult, life in the tropics may be made not only safe, but comfortable and enjoyable.

Reviews.

HANDBOOK ON LEPROSY. By E. Muir, M.D., F.R.C.S. 1921. Published by R. J. Grundy, Cuttack.

This is a very useful little book written from the author's Indian experiences, and compiled mainly as a handbook for the general practitioner in the endemic area. It is divided into five parts; the first describing the diagnosis of the disease, onset, discoloration of the skin, and eye affections, &c. The second part is devoted to methods of treatment, preparations of chaulmoogra and hydnocarpus oils, vaccine therapy, and the treatment of accompanying diseases, such as hookworm, malaria, syphilis, &c. The last three parts deal with isolation and segregation of lepers, leper asylums, and general research with regard to leprosy. The book is written in a simple style, avoiding as much as possible technicalities, and is accompanied by fifty-six illustrations.

The author is to be congratulated on his work, which should prove to be of value both in and outside India.

AIDS TO TROPICAL HYGIENE. By R. J. Blackham. Second Edition. London: Baillière, Tindall and Cox.

This is the second edition of this booklet on Tropical Hygiene. The author found it necessary to revise his original work, owing to the great increase of knowledge on the subject gained during the campaigns of the Allied Armies in various parts of the tropics. The result is a concise and handy pocket-book which contains a neat summary of the main facts which have to be reckoned with, namely, climate, ventilation, feeding, clothing, insects, disinfection, prevention of malaria, &c. It will prove to be of great help to medical men stationed in the tropics, and also to students for the D.T.M.H. who require to be conversant with all such problems.

STUDIES IN INFLUENZA. By D. Barty King. 31 illustrations. Published by J. and A. Churchill, London.

This is a valuable little book of practical importance. The matter is dealt with in three sections, the first being a study of an outbreak of influenza amongst 150 cases of malaria, accompanied by a number of very interesting charts. The second section contains a description of the after-effects of the acute pulmonary complications of influenza as revealed by clinical, radioscopic and post-mortem examinations; and the third and last section is devoted to the effects of the epidemic on the Nursing Staff of the County of London (Horton) War Hospital.

Correspondence.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

GENTLEMEN,—My attention has been called to a leading article on "Mushroom Poisoning" which appeared in your Journal on August 1. The explanation of the discomforts of the writer of the article is simple. Certain fungi were gathered under the impression that they were field mushrooms (*Psalliota campestris*). Perfectly innocuous young puff-balls were rejected, but a poisonous form (probably a species of Entolima) was retained and eaten with the usual results. If *Amanita phalloides* had been present the chances are about even that there would have been a post-mortem. The vast majority of people in this country restrict their fungus eating to the field mushroom (or the cultivated variety). It is, however, quite as essential here as where a more catholic taste obtains, that the fungus should be recognized before being placed in the "pot." The fables of rustics as to alteration in species are as scientifically sound as would be one that assumed a difference in the victim's digestion owing to last year's drought.

In cases of suspected fungus poisoning, I should always be pleased to give what assistance I could in identifying the species concerned.

I remain, &c.,

J. RAMSBOTTOM.

British Museum (Natural History),
Cromwell Road, London, S.W.7.
Sept. 12, 1922.

Original Communications.

OUTBREAK OF SMALL-POX IN ANGUILLA, B.W.I., IN 1921.

By S. B. Jones, M.A.Durham, B.A.Lond., M.D.Ill. Med. Coll.
Medical Officer, Anguilla, B.W.I.

The following account of an outbreak of small-pox in the island of Anguilla, B.W.I., may be of some interest in connection with similar outbreaks, more or less mild, in other parts of the New World and in Europe; and besides this, it may illustrate the problems of public health which may at any moment confront the health officer in some lonely outpost of the Empire, separated from his head-quarters by miles of sea, and sailing craft being the only means of communication with the outer world.

Anguilla is the most northerly of the Colony of the Leeward Islands group, with its greatest length of sixteen miles from north-east to south-west, and its greatest width of three miles from east to west. It formed a part of an old Antillean continent, and the fragments of lignite and fossil resin washed up on its western shores at certain seasons point to ancient forests spreading far to the west and south, but now submerged beneath the depths of the sea. Flat, treeless, its contrasts are few. The prevailing winds from north-east to south-west sweep over it continuously, modifying its climate almost to that of a sub-tropical country. There are no streams, and the few wells afford only brackish water. In seasons of drought the sufferings of the inhabitants are intense, persons being compelled to get up at midnight and walk from three to four miles to secure a scanty supply of water trickling from the springs of the few wells.

Colonized about the year 1650 by Englishmen, it is said to have been the original home of the far-famed sea island cotton. At the present time it is administered by the Government of the Presidency of St. Kitts-Nevis, and forms a single medical district of about 5,000 inhabitants, the medical officer being also health officer and magistrate. Its inhabitants are chiefly black and coloured people, who till their own small holdings which afford them and their live stock sufficient food when the rain-fall is ample. The island is, however, subject to drought, and when this is extremely severe, the islanders are forced to emigrate to get food and clothing for themselves and their families. But, in spite of drought and emigration, the population, unlike that of the other islands of the group, has always shown a tendency to increase. For example, in the year 1819 there were 365 whites, 327 free coloured and blacks, and 2,388 slaves—a total of 3,080; in 1921 there were 98 whites, 1,065 coloured, and 3,071 blacks—a total of 4,230.

With the expansion of the sugar industry in Santo Domingo there was a demand for a reliable source of labour, and this the natives of Anguilla supplied. For six months of every year the men would emigrate to work on the vast "colonials," or sugar estates in Santo Domingo, reaping the sugar-canes, and returning when the crop was over to their homes in Anguilla, where for the other six months they attended to their own small holdings, on which they grew sweet potatoes, peas, beans, maize and cotton, the last affording a money crop to supplement their earnings from Santo Domingo.

The emigrant labourers make their voyage to Santo Domingo in Anguillan schooners, and Anguilla thus becomes the clearing house for emigrant labour from the other islands. It is thus readily seen that the lane of travel of any epidemic disease in Santo Domingo to the British West Indies is by way of Anguilla.

On January 25, 1921, at ten o'clock in the morning, the medical officer received a despatch from the Chief Medical Officer, St. Kitts, advising him that small-pox existed in Santo Domingo. Notices were at once issued all over the island informing the population of the fact and urging all to be re-vaccinated, as a second vaccination was almost always necessary for effective immunity. There are three divisions in the island, corresponding to the parishes of the larger islands—Road, Valley and Spring. The two former being nearer to the point of danger, for all but one of the Santo Domingo trading ships entered the Road Harbour, primary vaccinations were pushed forward rapidly in these districts. Adults were invited to come forward, and no charge was made for vaccinations. This they did slowly at first, thinking that the vaccination of childhood was sufficient, and fearing the discomfort of vaccination at a time when labour in the fields was a pressing necessity. Gradually their prejudice was overcome. The Revenue officers were the first to present themselves voluntarily, realizing that they would be the first to be exposed to the danger. The crews of all but one of the vessels engaged in the Santo Domingo trade were revaccinated. By the end of July there were recorded 719 successful vaccinations for the first six months of the year; that is, while waiting for the blow to fall, about one-sixth of the population had been protected adequately and thoroughly.

Just sixty years before this an epidemic of small-pox had broken out in the island. On January 19, 1861, the disease was introduced from the island of St. Kitts by a young boy, from whom the infection spread rapidly all over the island. It was probably a severe form of the disease. A papular rash "like large grains of pigeon peas" (*Cajanus indicus*) was to pass into a terrible œdema of the face, closing the eyelids and blinding the patients for days. Both confluent and discrete forms of the disease are hinted at; and the graphic description of one of the sufferers of her condition, with the whole body covered with blood day by day, inclines one to the belief that the hæmorrhagic type was also present. Clothing was intolerable, and the patients were placed on the tender leaves of the banana plant, only to find their discomfort intensified as the moisture from these evaporated. Pustules were opened and gently bathed with milk.

In some cases, as the disease abated, the skin of the face came off like a mask, to the wonder and amusement of the younger people.

There was no physician in the land. A layman, Mr. Adolphus Hodge, who had some knowledge of medicine, and the Rev. Henry Warneford, Rector of St. Mary's Church, gave what medical assistance they could. The latter gentleman secured lymph from abroad and began the vaccination of the people, many of whom, self-reliant then as now, in turn performed arm to arm vaccination, usually in the case of members of the same family. Curiously enough, one of the small-pox victims, then a boy of about 8 years, was recently successfully vaccinated, three good scars resulting, thus indicating that one attack of small-pox may not confer a permanent immunity—against vaccination at least.

On August 1, 1921, the sloop *Convincer* arrived from Macoris, Santo Domingo, with 138 persons on board, among them being G. A. R., a native of

Small-pox patients, Anguilla, 1921. Eighth day of eruption.

Anguilla, who was ill on board with a papular rash on forehead, face and hands, which the medical officer diagnosed at small-pox. The supply of lymph having been exhausted, it was impossible to vaccinate contacts. The ship was accordingly allowed food and water and sent to St. Kitts for confirmatory diagnosis and for quarantine disposition. But the Quarantine Board of St. Kitts ordered the return of the ship to Anguilla, as there was a larger number of Anguillans on board than natives of St. Kitts. She returned on August 3, and on the same day the schooner *Warspite*, with 138 passengers on board, was allowed free pratique, as her twelve days of quarantine had expired without any suspicious case. Shortly after the schooners *Eagle* and *Muriel* entered port, each with a case of small-pox on board. There were thus two schooners and one sloop quarantined in the Road Harbour with a total of 358 persons on board. Two days later medical assistance arrived in the person of Dr. T. L. E. Clarke, M.D., C.M.McGill, who was sent with directions to assist in disposing of the 358 persons in quarantine and in caring for the sick. In the meantime the *Warspite* had returned from St. Kitts with a case of small-pox on board, thus making a total of 406 persons in quarantine, four of them at that time being ill with small-pox.

The Quarantine Board of Anguilla finding it impossible to employ Sandy Island, a small islet, situated four miles outside of the Road Harbour, as a quarantine station owing to the difficulties of furnishing food and water at that distance, and the uncertainties of the hurricane season, decided that the first serviceable measure was to relieve the congestion on board the sloop *Convincer* by supplying two relief ships, the one to be used as a hospital ship, on which all the sick would be placed, and the other to allow of more space for the passengers.

On August 6 a passenger from the *Warspite* residing in the Road Port was found to be suffering from small-pox, the two medical men agreeing upon the diagnosis. Notification was immediately sent by special boat to St. Kitts, and also to the neighbouring French island of St. Martin, and the medical officer of Anguilla assumed the duties and responsibilities of health officer for the island.

The men on board the ships were suffering from the heat, which caused intense thirst, with difficulty assuaged by the scanty supply of water furnished by the Road Well, at that time almost dry, and by casks of water sent from the Valley Well, a distance of four miles. Their relatives supplied them with food brought in some cases from distances as great as six or eight miles. Lice were causing a good deal of annoyance to them, and the dread of an outbreak of typhus fever among them caused increased anxiety. To keep them on board meant beyond a doubt the spreading of the small-pox infection, the danger of typhus fever, possible deaths, the probability of a determined attempt on their part to land in their desperation, with the consequent inability to control the disease. Humanity dictated that they should be landed and the best measures possible taken at the same time to safeguard the community, while commonsense showed the folly of shutting up men who were well with those who were sick.

Arrangements were made for beginning the landing on the afternoon of August 6. Every person on board the ships was to pass the medical officers, one boat after another effecting the landing under the supervision of the only two police constables on the island; their name and address were to be noted; each was to be vaccinated as soon as lymph was procured and remain under medical surveillance for fourteen days. All passengers, women excepted, were to go overboard and take a bath, then put on clean clothing before getting into the boats to be taken ashore.

Through the good offices of Mr. Carter Rey, the leading planter and largest landowner, a supply of lymph was most generously assigned to Anguilla by the Governor of Dutch St. Martin, sufficient to vaccinate four hundred persons. The health officer

had personally obtained this himself on the night of August 6 by going to St. Martin in the *Warspite* and having it delivered to him by the Mayor of French St. Martin, who was most eager to render all assistance he could to the stricken British island of Anguilla. Armed with this supply of lymph, the medical officers began the vaccination of all contacts on the ships as arranged by plan. They next turned their attention to the landing of the sick men, detaining along with them two boys who were barely convalescent on the date of their embarkation in Macoris, Santo Domingo. These were all safely landed by half-past six on the afternoon of August 7, and along with them went to the isolation tent the patient in whom the disease was first detected on shore. This tent was erected on a promontory overlooking one of the horns of the Road Harbour; an orderly was secured, and guards were placed.

For the next fourteen days all of the contacts, some four hundred in number, reported daily to the two medical men. A record of the temperatures of all suspected persons was kept. Absentees from the roll call were immediately visited. The bulk of the population, realizing that the measures taken were for the general good, constituted themselves into a committee of one and brought in reports of suspected persons. An efficient intelligence service was at work, in so much that cases of small-pox were reported as such before the medical officers could make up their minds on a diagnosis, and often the lay diagnosis was subsequently confirmed In this way suspected cases were removed early to the isolation tent, and the whole family in which they occurred immediately vaccinated.

On the Sunday of the landing an isolation hospital 6 ft. by 20 ft. was started and completed in nineteen days by Anguillan workmen. Cots and stretchers were made locally, but the greater part of the cots with medical supplies were soon rushed to the island from St. Kitts. The work on the hospital was hurried on, the men working overtime and on two Sundays. Though life in the tent was becoming by this time well-nigh unbearable through overcrowding, isolation was rigidly insisted on and the patients made as comfortable as possible, being urged at the same time to have a little patience until they could be housed in suitable quarters when the hospital was complete. Fortunately, the hospital was ready before admission of the two women, who were able to enter the female ward when they were brought to the isolation station.

As even intelligent persons doubted that the disease was small-pox, a scheme of public information had to be carried out. A circular was issued by the health officer to the two ministers of religion in the island inviting their aid, and suggesting that special mention of small-pox should be made on Sunday and the people urged to come forward for vaccination and revaccination. Notes on small-pox were prepared by him and furnished to these gentlemen. They were shown how it is fought, and the plan of campaign in Anguilla was clearly put before them for the instruction of the people, namely:—

(1) Vaccination.

(2) Revaccination.

(3) Prompt reporting of the sick and immediate isolation of all small-pox patients.

(4) Exposure of all clothing and articles brought in the ships to the hot sunlight for a week.

(5) Permitting the air to blow freely through all the houses.

"The greater fight is now on," ran the circular; "the whole population, old and young, must be thoroughly vaccinated. A single vaccination in childhood is not enough. Let all help. God helping us, we shall and must win the fight."

The result was that the people came in crowds for vaccination, being often turned away for lack of lymph. The thoroughness and completeness of vaccination and revaccination were limited only by the quantity and quality of the lymph supplied, and not by apathy nor dilatoriness on the part of the population, nor lack of zeal on that of the medical officers.

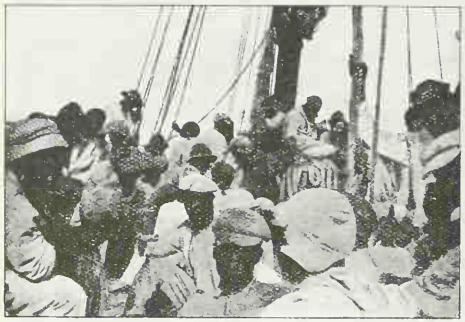
Some small-pox contacts, Anguilla, 1921. "Under surveillance."

Dr. Clarke remained for nine days and rendered yeoman service, sparing himself neither by day nor by night in his effort to detect hidden cases and in performing vaccinations as far as the supply of lymph would permit. He was succeeded by Dr. E. G. Wheat, M.D.Cantab., a physician of the highest medical attainments, of wide experience, and an expert on small-pox. Along with the task of vaccinating in the Valley Division in the morning and the Road in the forenoon, this gentleman was entrusted with the medical care of the patients in the isolation camp, Mr. J. F. Gumbs, Revenue Officer, Road, meanwhile acting as hospital superintendent, supervisor of the erection of the isolation hospital, and generally as executive quarantine officer in the Road Division, all duties which he performed with vigour, efficiency and patriotic devotion.

Six of the cases first segregated were those of small-pox of moderate severity. One was of the confluent type and the rest mixed confluent-discrete. The eruption covered these from head to

foot. Among them there was considerable œdema of the face and lower extremities which lasted for several days, accompanied by exquisite suffering as the pocks strove to break through the skin of the sole of the feet; septic symptoms appeared, but convalescence was rapid, pustulation at no time assuming the terrifying aspect described by Lieutenant Mead in one of his cases as "the skin of the face literally floating on a sea of pus." In one of the cases the skin of the feet peeled off in large patches.

In the case of all the boys the malady was that of a modified small-pox, astonishingly mild in character. All of these showed a prodromal rash, discrete, consisting of fine vesicles appearing on the subsidence of the fever and just prior to the slight papular eruption. One of these had a pustular conjunctivitis; one, œdema glottidis, a few pocks being present in the throat. Most had been unsuccessfully vaccinated in infancy, and their escape from a severe attack may possibly be due to a vaccination conferring a partial immunity, even though no scar resulted



Repatriated labourers on quarantined schooner.

The greatest sufferers were those who had never been vaccinated, or who had been vaccinated forty or fifty years before. The comparative mildness of the attack may be ascribed to the fact that a virus already attenuated was passing through the bodies of men whose parents had had small-pox sixty years before or had been vaccinated at that time. All patients recovered, twenty-one being men and boys and two young women, some of the boys with hardly a mark. Brief case notes follow:—

(1) G. A. R., 67 years; Anguillan. Resident of Santa Fé Estate, Santo Domingo. Vaccinated in childhood, probably sixty years ago. Had fever on Friday, July 22; embarked on sloop *Convincer* on Sunday, July 24; found bumps on his forehead on that evening. Great œdema of face, hands and feet. Mixed type of variola (confluent-discrete) of moderate severity.

(2) E. C. L., 26 years; Anguillan. Worked at shoemaker's trade on Santa Fé Estate, Santo Domingo. Disease in papular stage on arrival in port. Considerable œdema of face; pocks extremely thick on face. Mixed type of variola (confluent-discrete) of moderate severity.

(3) G. L. L., 19 years. Labourer on Angelina Estate, Santo Domingo. French. Had seen lots of people sick with the disease, most of them Français (Haitians). The disease attacked the Français (Haitians) more than the English people. Had lived in a room with a man who was sick with fever, and at the same time shotty pimples were coming out on his face. Had never been vaccinated. Œdema of face, hands and feet. Case assumed a grave aspect at one time, but recovery complete. Mixed type of variola (confluent-discrete) of moderate severity.

(4) A. D., 67 years; Anguillan. Labourer on Angelina Estate, Santo Domingo. Had never been vaccinated. Prodromal rash, slightly vesicular. Patient with large scrotal hernia. Mixed type of variola of moderate severity. Scrotal abscess as sequel. Incision. Discharged cured.

Small-pox patients, Anguilla, 1921. Two boys are convalescent. The old man was the first to arrive with small-pox—crust formation.

(5) J. A. L., 42 years; St. Vincent. Vaccinated in childhood—four good scars—and in Panama in 1911. Œdema of face, feet and hands. Throat involvement. Mixed type of variola of moderate severity.

(6) J. L., 40 years; Anguillan. Labourer on Santa Fé Estate, Santo Domingo. Had never been vaccinated in childhood. Confluent type of variola, moderately severe.

(7) J. N. R., 23 years; Anguillan. Labourer on Santa Fé Estate, Santo Domingo. Became ill on August 8; rash came out on August 11. Unsuccessfully vaccinated in childhood. Discrete variola, mild.

(8) F. B., 22 years; Anguillan. Labourer on Consuelo Estate, Santo Domingo. Became ill on August 16. Sent to isolation camp on August 19. Prodromal vesicular rash. Had never been vaccinated. Vaccinated on August 15—two good

scars. Discrete variola, undoubtedly modified by vaccination during the incubation period.

(9) J. H. L., 15 years; Anguillan. Had never been vaccinated. Labourer on Santa Fé Estate, Santo Domingo. Modified discrete variola, with throat involvement. Œdema glottidis threatened, but averted.

(10) T. B., 12 years; Anguillan. Labourer on Angelina Estate, Santo Domingo. Had disease in Santo Domingo, and was convalescent when removed to isolation tent. Had seen plenty of Dominicans and Français (Haitians) sick with it and had lived in the same house with them. A few discrete pigmented scars; no pitting. Vaccinated on leaving isolation camp effectively, two good scars showing.

(11) J. R., 33 years; Anguillan. Labourer on Santa Fé Estate, Santo Domingo. Had never been vaccinated. Discrete variola, mild in character.

(12) W. A. C., 14 years; Anguillan. Labourer on Santa Fé Estate, Santo Domingo. Vaccinated in childhood, but no visible scar. Prodromal vesicular rash. Modified discrete variola, of unusually mild type.

(13) J. H. H., 13 years; Anguillan. Labourer on Angelina Estate, Santo Domingo. Vaccinated in childhood, but no visible scar. Eye complication —pustular conjunctivitis of right eye. Slight vesicular prodromal rash; a few papules on palms of hand. Modified variola, of unusually mild type.

(14) J. I. L., 30 years; Anguillan. Labourer on Santa Fé Estate, Santo Domingo. Had never been vaccinated. Discrete variola, mild in character. Vaccinated during stage of incubation, unsuccessfully at first; later, successfully, two good scars resulting. Variola, undoubtedly modified by vaccination, though both infections ran their course at the same time.

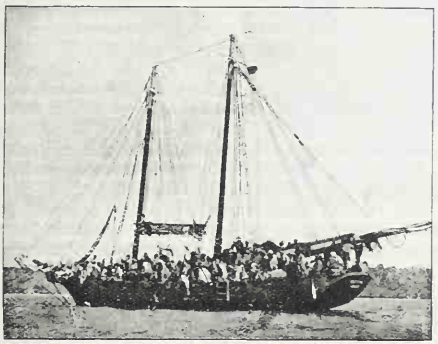
(15) D. R., 17 years; Anguillan. Labourer on Angelina Estate, Santo Domingo. Had seen people with the disease in Santo Domingo. Had been vaccinated in childhood, two scars shown. Admitted while convalescent to isolation tent to get rid of scales.

(16) J. B., 39 years; Anguillan. Labourer on Santa Fé Estate, Santo Domingo. Became ill on August 1. Discrete variola, comparatively mild.

(17) W. W., 33 years; native of St. Kitts. Vaccinated in childhood, but no scars shown. Unsuccessfully vaccinated during the incubation period. Discrete variola, comparatively mild.

(18) W. H. N., 57 years; Anguillan. Labourer on Santa Fé Estate, Santo Domingo. Had been vaccinated in childhood. Vaccinated during the incubation period, with two good scars as result. Discrete variola, remarkably modified by successful vaccination at the beginning of the incubation period, as noted even by his fellow-patients.

(19) G. H., 14 years. Labourer on Angelina Estate, Santo Domingo. Preliminary vesicular rash. Modified variola, unusually mild in type.



Schooner in quarantine with repatriated labourers from Santo Domingo.

Convalescent patients discharged.

(20) R. R., 39 yeârs; Anguillan; sailor. Slight prodromal vesicular rash. A few papules on back, desiccating without pustulation. Vaccinated in childhood and during the incubation period, though unsuccessfully. Had been the nurse of the first small-pox victim all the way from Macoris. Modified variola, of unusually mild type.

(21) C. E., 14 years. Unsuccessfully vaccinated in childhood. Some œdema of face and feet. Discrete variola, mild in type.

(22) A. V., female, 28 years; Anguillan. Vaccinated in childhood. Neglected revaccination. Modified variola, papules surprisingly few, drying without pustulation.

(23) A. R., female, 30 years. Vaccinated in childhood. Avoided revaccination. Modified variola, extremely mild in type. Rash discrete, pustules few and slight.

Up to August 20 early diagnosis and prompt

isolation had succeeded in confining the disease entirely to persons from the infected ships, and there was some degree of hopefulness that the infection would not spread to the general population; but two cases were reported in the Spring Division of the island, the weakest place in the defensive scheme, owing to the large number of contacts from the sloop *Convincer* resident there. The attack was so mild in the two young women affected that the occurrence of the cases, though not so regarded at the time, was of some help to the health officer in estimating the progress of the epidemic. In one case only a few papules proceeded to the stage of pustulation; while in the other the papules dried up rapidly, and a few days after isolation could hardly be discerned. It was a sign of favourable omen; the disease was being held fast; there was good hope that victory would soon be in sight.

At no time was the writer tempted, because of the mildness of the symptoms, to apply to the disease such euphemistic terms as Kaffir milk-pox, alastrim, amaas and the like, for this would have lulled the population into apathy and kept them from realizing the value of vaccination and revaccination. V. E. Watkins, of La Romana, Santo Domingo, who had witnessed the spread of the disease from the Haitian border, by way of Barahona district, and had sought to check it at La Romana by vaccinating as many as 7,000 persons, is of the same mind.

"The clinical evidence," he writes, "presented by this disease does not warrant any other diagnosis than small-pox . . . and the attempt to describe it as a separate and distinct disease under another name only leads to confusion and creates a sense of false security." Certain symptoms, it is true, will hold the attention of some observers more than others. The observations of Watkins placed the incubation period at twenty-one days; while on the Anguilla cases the incubation period as noted in some sixteen persons infected from the one case on the sloop *Convincer* varied between twelve and sixteen days. True umbilication of the vesicles was absent from most of the cases, present in a few. One of the patients had on the first day of surveillance a temperature of 105° F., vomiting, headache, lumbar pain, and the eruption was confidently looked for, but on the third day the temperature dropped to normal, there was no rash of any kind, and if there is any such entity as a *variola sine eruptione*, one might be tempted to place this case under this description.

The two medical officers, the orderlies, and the camp superintendent went freely among the patients, relying solely upon recent successful vaccination for protection. There was no case of small-pox among them. The orderlies slept with the patients, and were with them all the time until the last patient was discharged. Throughout every district of the island vaccination and revaccination were carefully carried out, though owing to the hot weather then prevailing, the absence of ice, and the inactivity of some of the lymph furnished, the results were not all that could be desired, causing disappointment to the health officer and to the people, many of whom were unsuccessfully vaccinated from five to six times.

A cursory glance at the brief case notes will show how variola and vaccinia may progress together, and this bears out the assertion of John C. McVail that "the vaccinal process runs a shorter course than the incubation stage of small-pox, and if the operation be performed within two or three days after infection, vaccinia gets home first." It is further thrown out as a suggestion for consideration that where vaccination proves successful, as in some of the Anguillan cases, when the patients were convalescent, the small-pox infection was a mild one, and the individual was still liable to a severe form of the disease at a future date.

Summary.

On August 1, 1921, a case of small-pox arrived in Anguilla, B.W.I., from Santo Domingo, where the disease was prevailing in epidemic form. The number of cases finally increased to twenty-three.

There being no quarantine station for isolation purposes, the four hundred contacts were released and kept under daily surveillance for fourteen days.

Prompt isolation of infected persons, vaccination and revaccination succeeded in checking the disease, so that only two persons in the population of over four thousand contracted the disease.

The clinical symptoms were those of modified variola occurring in a population of British West Indies, unlike the Haitians, accustomed to vaccination in childhood.

The absence of "conscientious objectors," the loyal co-operation of the whole population, the energetic measures of Major J. A. Burdon, C.M.G., Administrator of St. Kitts-Nevis, in hurrying to the scene of the epidemic sufficient lymph to vaccinate the whole population, were all contributory factors towards the successful stamping out of the epidemic within the space of six weeks.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 16, 1922.

NOTES ON SPAS.

THE spas and watering places at home and abroad are closing their doors with the oncoming of October, and the frequenters are returning to their homes, or to their place of work, be it in the tropics or elsewhere. British folk, whether from the tropics or from their native land, have been undergoing the "cure," or drinking the waters on the Continent of Europe, there to "Bousin' drumly German water to mak' themselves look fair and fatter," or "Maybe, in a Frolicdaft, to Hague or Calais, takes a waft, To make a tour and take a whirl, To learn bon ton and see the worl'." The Continental waters from the "Source d'eau minérale" to Lourdes, from Kissingen to Hunyàdi János, have been patronized as widely as in pre-war times, for it seems that whatever poverty prevails the spas and watering places are a necessity for the populace of all grades. Some were sent to this and that place by their physician, and treatment was as freely indulged in as ever, and so it will go on for all time. That good is derived therefrom is undoubted; for a change of any sort, be it with or without the accessories of "drumly water" of sorts, always does good. The benefit of such change continues for a month or so after home is reached. That it extends beyond that period of time is seldom the case, but during the second month a relapse is the rule, and the general practitioner gets busy again. The gouty aches and swellings return, the liver is "worse than before I went," and bronchial wheezing is again to the fore. The real permanent benefit of such spa treatment is a question; it has never been scientifically dealt with. The aftermath or post hygienic state of active spa treatment is a study by itself, and has yet to be handled therapeutically. It is but on a level with physical states that follow on summer sports indulged in by the athlete, by that most difficult of all stages in the act of training, namely, how to go out of training without danger to the heart and circulation. The fact is that it takes as long to get out of training without leading to a breakdown as it did to get into a perfect condition for a strenuous contest. The 100 miles a day on a bicycle for a week or fortnight requires a longer period to become *un*trained, without causing circulatory or digestive trouble even with young lads, and leads to many an ailment which may give rise to a prolonged feeling of upset, which ends in depression, morosoness, insomnia, tiredness, and disinclination for exercise. Evils of similar sorts frequently follow an active spa treatment, and to regain the normal safely and without "regrets" should be regarded seriously and a line of treatment prescribed. For many spas the salts which are regarded as the cause of the benefit of cure at this or that spa is made up into tablet or lozenges, or the places where the water is to be obtained nearby their homes is set forth; but the lozenges are played with for a few weeks after reaching home or the special fluid supplied in litre bottles is dropped except occasionally when things are not going as they should. With the advent of colder weather the blood is driven from the surface of the body on the internal organs at the same time as the special salts they brought home with them are becoming exhausted, and the two combined lead to feeling out of sorts, sleeplessness, shortness of breath, and constipation, and all the attendant evils. What should be done? There are plenty wise men and good practitioners who can

advise the returned " curéd " middle-aged man what to do. Diet and drugs, appropriate exercises, baths, &c., &c., are all to hand. It must be remembered that the spa doctor has the advantage of open air to help him, but the daylight of October is shorter, the mornings and evenings are rather drawn in, and a walk in the streets in the dark is not attractive recreation.

In the tropics the same drawbacks do not present themselves. One has time for a daylight walk after the office is closed and for about one hour's safe period for out-of-door exercise after daylight comes in. The morning exercise should never be taken on an empty stomach: either fruit or tea with bread and butter or biscuits, &c., but never take early morning riding or walking or golf before one partakes of food, and the bath (warm) after coming home. If the exercise is taken in the afternoon, in winter at home walk one hour (a day) after leaving office, change the clothing on reaching home, and take a bath (warm) before sitting down to the evening meal and with dry clothing next the skin.

Where should one send a tropical patient to with a big liver from malaria, from alcohol, or from want of exercise? Not to low ground or over three thousand feet above sea level, nor to the seaside. At a height of from 1,000 to 2,000 is most advisable. In Britain, Braemar in Aberdeenshire, Aviemore or Granton-on-Spey on the Highland Railway, Strathpeffer in Ross-shire, the town of Nairn in Nairnshire. In cases of malarial spleen to Switzerland some 4,000 to 5,000 feet up from middle of January to middle of March, and to the above-mentioned places in Scotland from March onward.

An enumeration of the better known mineral waters, spas and their uses can only be given here.

Alkaline waters.—Carbonate of sodium is the prominent constituent; carbonic acid is almost invariably present; chloride of sodium in many waters is a frequent component, so much so that it is responsible for dividing the alkaline waters into *simple* and muriated.

The uses are definite in digestive disorders (gastric, intestine, hepatic), uric acid and its results, catarrhal affection of the respiratory, digestive and genital tracts.

Simple alkaline waters are met with principally in Vichy, where they are *hot;* in Vals, Salzbrunn, Apollinaris, Taunus, Ems, where they are cold.

Muriated alkaline waters.—Ems, Royat (hot, contains lithium); Selters, Gleichenberg, La Bourboule (cold).

Sulphated Waters.—Sulphate of sodium or magnesium, or both sulphates predominate. Uses: Sluggish portal circulation and its concomitants, gout, lithiasis and diabetes, splenic fulness.

(1) Principal simple sulphated or bitter water: Pullna, Seidlitz, Hunyàdi János, Friedrichshall, Epsom, Leamington and Cheltenham.

(2) Principal alkaline sulphated waters: Carlsbad, Marienbad, Tarasp-schulz, Elster, Bertrich. The first and last-named of this group are modified by their thermal nature (Webber).

Iron or Chalybeate Waters.—Uses: Primarily in anæmia, malaria, cachexia, chlorosis. All require preliminary treatment by salines, &c.

Comparatively pure, containing few other ingredients: Schwalbach, Spa, Tunbridge Wells, Harrogate.

Compound iron springs: Iron with carbonic acid, carbonates of sodium, calcium, magnesium and sulphates of the same and sodium chloride, at Pyrmont, Driburg, Griesbach, Antogast, Elster, St. Moritz, Godesberg.

Sulphur waters containing sulphuret of hydrogen or sodium, calcium, potassium, magnesium, partly thermal. Used both as baths and internally. The thermal sulphur waters are at: Eaux Bonnes and Chaudes, Aix-les-Bains, Aix-la-Chapelle, Baden (in both Switzerland and in Austria), Helouan (Egypt), cold. Sulphur springs: Eilsen, Weibach; and in Britain—Harrogate, Llandrindod and Builth, Moffat and Strathpeffer.

Earthy and calcareous waters contain for the most part carbonate and sulphate of calcium and of magnesium. Uses: Antacid and soothing effect on the mucous membrane of alimentary tract; useful in osteomalacia, skin ailments, diarrhœa due to acidity of intestinal canal, and in chronic catarrh of the bladder.

The best known of these waters are found at Wildingen, Lippspringe, Contrexéville, Vittel, Bagnères de Bigorre, St Arnaud and Cransac. Of the table waters of this group, the best known are found at Cauzan, St. Galmier and Taunus.

Annotations.

The Action of Diphtheria Toxin on Mice (A. T. Glenny and K. Allen, *Journal of Hygiene*, vol. xxi, No. 1, June, 1922).—For the particular toxin tested, the intravenous m.l.d. for mice was sixty times, and the intramuscular m.l.d for mice 100 times, the guinea-pig subcutaneous m.l.d.

Antitoxin has the same neutralizing power for toxin in mice as in guinea-pigs.

Studies upon Experimental Measles (Charles W. Duval and Rogney D'Aunoy, *Journal of Experimental Medicine*, vol. xxxvi, No. 2, August, 1922).

There is present as a causal agent in the nasopharyngeal secretions of measles cases a filter-passing virus.

The rabbit and the guinea-pig react specifically to the intratracheal and intracirculatory injections of filtered nasopharyngeal secretions secured from cases of human measles.

Enanthem, exanthem and pyrexial disturbances characterize this specific reaction in the rabbit; in the guinea-pig the reaction manifests itself by pyrexia, leucopenia, and grave nephritis in the fatal cases.

The Loss of Hæmolytic Capacity by a Fraction of a Culture of a Hæmolytic Streptococcus without Change in Agglutination Characteristics (Eugenia Valentine and Charles Krumwiede, *Journal of Experimental Medicine*, vol. xxxvi, No. 2, August, 1922).—A culture of hæmolytic streptococcus developed a non-hæmolytic fraction which, as determined by its agglutinogenic, agglutination and agglutinin absorption characters was identical with the hæmolytic fraction, the only variation being one of function, or physiological action. This functional variation has proved permanent, as long as observed, for both fractions have continued to breed true.

This study is offered as an additional evidence in favour of the hypothesis that functional changes among bacteria are, at most, only very infrequently associated with changes in the antigenic matrix of bacteria.

On the Further Notes of the Overwintering of House-flies (H. Kobayashi, *The Japan Medical World*, vol. ii, No. 7, July 15, 1922).—The author comes to the following conclusions:—

(1) *Musca domestica* overwinters in the adult stage, both female and male surviving. Overwintering of the pupal and the larval stage, if present, may be very rare; there is no positive datum of overwintering in these stages.

(2) *Muscina stabulans*, as well as *Musca domestica*, overwinter in adult stage, especially its female sex.

(3) *Fannia canicularis* and *F. scalaris* seem to overwinter both in adult and pupal stage.

(4) *Lucilia* and *Sarcophaga* overwinter exclusively in the pupal stage.

(5) *Calliphora lata* overwinters in adult stage, and there may be continual breeding in winter.

(6) *Ophyra nigra* overwinters in pupal and larval stages.

(7) *Stomoxys calcitrans* overwinters in pupal stage.

(8) *Mesembrina* sp. overwinters in adult stage, especially its female sex.

(9) *Scatophaga stercolaria* and several species of *Anthomyid* overwinter in adult stage.

On the So-called Para-agglutination (Yoshimasa Watanabe, *The Japan Medical World*, vol. ii, No. 7, July 15, 1922).—The agglutinative reaction of X bacillus is discussed. Weil and Felix bacillus is not the causative agent of typhus fever, but it is well known that this organism is agglutinated by the serum of a typhus patient. There are O and H types in the No. 19 strain of the X bacillus. It has been said that the O type has an O receptee, while the H type has H and O receptees. But according to the researches of Schiff and Yals, there are O agglutinin as well as H agglutinin in immunized rabbit serum with O type of the organism. Moreover, within the limit of the author's experiments, although the ordinal atypical bacilli lack in the receptors corresponding to the receptee of the O type of the X strain, there are receptors corresponding to H receptee which are agglutinated by immunized serum with H type of X strain. The serum of a typhus fever patient has agglutinin corresponding to the receptee of O type. Thus the theory of Weil, Sacks and Schiff should be accepted.

The nature of the Weil-Felix reaction is explained as follows: As the result of the conflict of the noxious substance of typhus fever and the cells of the body of susceptible animals the agglutinin is produced, which agreed with the receptees of the X bacillus. Therefore, when the animal is less susceptible or the fever is slight, it is not to be wondered that the amount of the agglutinin in the serum of the patient is almost non-existent. This proves that the negative Weil-Felix reaction does not indicate the absence of typhus fever.

The Bacterial Content of Telephones with Special Reference to Respiratory Pathogens (Clarence C. Saelhof, M.S., *American Journal of Hygiene*, vol. i, No. 2, March, 1921).—The author comes to the conclusion that various pathogenic bacteria are present and can be isolated from the transmitters and receivers of telephones.

Hæmolytic streptococci were isolated in 15·9 per cent., the diphtheria bacillus in 2 per cent., and the pneumococcus in 1 per cent., from the transmitters and receivers of ninety-four telephones. 90·9 per cent. of eleven strains of hæmolytic streptococci isolated were virulent for rabbits.

Sterilization of telephones should be practised to prevent the spread of virulent organisms. Cleansing with soap and warm water and subsequent sterilization in bichloride of mercury, lysol, &c., for a period of ten minutes is recommended. In speaking, the mouth should not come in direct contact with the transmitter. The public should be taught how to use the telephone hygienically.

Prophylaxis and Serum Treatment of Spirochætosis icterohæmorrhagica (Ryokichi Inada, M.D., Tokio, *The Japan Medical World*, vol. ii, No. 7, July 15, 1922).—In England and America this disease is known as the infectious jaundice, and the name *Spirochætosis icterohæmorrhagica* is only occasionally used. This latter name is now widely used in France and Italy.

The rapid increase in the number of cases of this disease in Japan of recent years is partially due to the fact the disease has now become well known, and consequently diagnosis is easily made. So great was the increase, however, that it was absolutely imperative that some sort of prophylactic and curative methods should be employed.

He then goes on to the consideration of the serum treatment. This treatment was introduced some five years ago, and many good reports go to

show its efficiency. It was found that the serum of a patient at convalescence had immune bodies which were able to destroy the organism. It was then thought that this serum might be used for the treatment of the disease. Comparative studies of the effect of salvarsan and immune serum treatment were made, and the latter was found to be far superior to the former. The action of the immune serum is destruction of the spirochæta, and the best results are obtained when the injection is made as early as possible, say within five days of the onset of the disease. Experiments were made both by subcutaneous injection and by intravenous injection of the serum.

Quinine Treatment of Malaria (P. Hehir, *Lancet*, February, 1921).—The author is a believer in the "large-dose" treatment with quinine in malaria with the view that it causes the disappearance of sexual forms from the circulation. It is a great responsibility for those who denounce the curative powers of quinine in this disease, as at present it is the best drug known, and its infrequent failures should act as a stimulus to further investigation.

Indigenous Malaria in France (Brue, May and Lermoyez, *Bull. et. Mem. Soc. Méd. Hôpit. de Paris*, December, 1920).—The authors describe a case under treatment for syphilis with novarsenobenzol, and which turned out to be indigenous malaria, making the tenth case reported in France. The patient had never been out of France, but had been with the Moroccan and Senegalese troops during the war. The predominant symptom was œdema; meteorism and enlarged liver and spleen were also present. He was cured by a treatment of 2 grm. of quinine hydrochloride daily.

Encephalitis lethargica with Severe Recurrent Narcolepsy (W. M. Kraus, *Proceedings from the New York Neurological Society*, December, 1920). —The author showed a boy who had lethargic or narcoleptic attacks during the day with insomnia at night. The patient had an influenza-like attack in February, 1920, and after this was continually somnolent for six weeks. He could be aroused to take nourishment, and he recognized his family at these times. This somnolent period was followed by a period during which he was unable to sleep at night, and was very sleepy during the day. He would fall asleep while standing up. He was admitted to Bellevue Hospital, where an examination was made. The case was considered to be typical of the group showing involvement of the basal ganglia.

Spiroehætosis Bronchialis (G. Korthof, *Gen. Tijdschr. voor Ned.-Indie*, 1921).—The author gives a very full description of six cases of Castellani's broncho-spirochætosis found in Java, two of the cases being of the acute type.

Urotropin in Malaria (A. Vasilesco and V. Vasiliu, *Bull. et Mem. Soc. Méd. Hôpit. de Bucarest*, December, 1920).—No benefit resulted from an experiment tried by the authors of the action on malarial parasites of two to four intravenous injections of 2 to 3 grm. each of urotropin.

Infection of Man by an Organism closely allied to Bacillus suipestifer (Hog Cholera) (Lt.-Col. J. Mackenzie, R.A.M.C., *Journal of the R.A.M.C.*, July, 1922).—The organism isolated by blood culture in this case conforms to the strains of *Bacillus suipestifer* in its morphology, cultural characteristics, serological reactions and virulence to animals. A search through the literature available has failed to discover a case in which a bacillus of like reactions has been isolated from the blood of man.

Acute Nephritis in Syphilis (D. N. Silverman, *New Orleans Medical and Surgical Journal*, March, 1921).—The author reports two cases of acute nephritis, in which clinically the kidney lesion was in close relation to the existing syphilis. There was no other accountable cause, and the disease responded promptly to anti-specific medication. One of the patients could not be followed to note the ultimate results of treatment and thereby prove its undisputed syphilitic nature. However, neoarsphenamin was found beneficial, and the signs of nephritis gradually subsided under its use.

Absence of Pancreatic Secretions in Sprue and Employment of Pancreatic Extract in Treatment (T. R. Brown, *American Journal of Medical Sciences*, April, 1921).—After various studies of the subject, the author has come to the conclusion that in certain cases of sprue there is practically complete absence of the pancreatic ferments, and that while, obviously, all the well-recognized forms of treatment, dietetic, hygienic, &c., should be rigorously carried out, nevertheless, very great improvement and, in some cases clinical cure, can be brought about by regular and constant administration of pancreatin.

Epidemic Prurigo among the Asiatics introduced into Europe during the War (W. Dubreuilh, *Ann. de Derm. et de Syph.*, ser. 6, 1920).—During 1916 and 1917 the author observed among the Annamites and Tonkinese numerous cases of an apparently infective pruriginous eruption with papules like those of prurigo or strophulus, which left a little brown macule on disappearance. The disease occurred mostly on the lower parts of the body and the lumbar region. Glandular enlargement was common, but no parasites were found. A cure was effected by weak tar and sulphur ointment.

A Trial Infusion of Eucalyptus in Diabetes (Henry J. John, *Journal of Metabolic Research*, vol. i, No. 4, April, 1922).—The infusion of eucalyptus leaves has no influence upon diabetes. This fact could be predicted with fair certainty from the existing knowledge of the pathology of the disease, but it is hoped that these negative observations under accurately controlled conditions will serve to overthrow the former claims of clinical benefits. It still stands as a fact that no drug has ever been found to possess any specific action upon diabetes.

The Disease-carrier Problem in the Philippine Islands (Concha Brillantes, *Philippine Journal of Science*, July, 1920).—Carriers of typhoid, cholera and diphtheria have been definitely proven to occur in the Philippines, but so far the greatest amount of research has been done in connection with cholera-vibrio carriers. Carriers apparently do not play an appreciable part in the spread of typhoid fever, at least in Manila.

Carriers of the diphtheria and cholera bacilli, on the other hand, do play an important rôle in the dissemination of these diseases and constitute the main factors in the annual outbreaks that have been observed.

Kala-azar in Assam (J. Taylor, *Annual Sanitary Report for the Province of Assam*, 1920).—Out of fifty-eight villages under segregation for kala-azar during the year, thirty-three were in Sibsager and twenty-five in the rest of Assam. The small number of villages segregated in the old endemic areas shows that the measure was not found possible of application on a large scale to deal with the conditions in these areas. Segregation is undoubtedly of value in preventing spread if applied with sufficient thoroughness and carefully supervised and enforced, but provides no relief for the actual sufferers from the disease, and successive crops of cases amongst the segregated are frequent. It is well recognized that the arrival of a case of kala-azar is the usual preliminary to the occurrence of an outbreak, and the enforcement of segregation is of value in preventing spread to an otherwise uninfected area. Other methods of relief adopted are treatment with antimony tartrate.

The Hæmolytic Organisms of Normal Infants' Fæces (E. W. Todd, *Journal of Hygiene*, vol. xxi, No. 1, June, 1922).—No entamœbæ, cysts or other parasites were found. Streptococci were present in the stools of all babies more than three weeks old, but only three hæmolytic strains were isolated, which appears to be a lower proportion than occurs in adult stools.

Colon bacilli were present in the stools of all babies more than two weeks old, and hæmolytic strains occurred in 12 per cent. of the specimens examined—that is, in the same proportion as in adult stools.

Staphylococcus albus was much more commonly found than in adult stools and in greater abundance.

There was no bacteriological difference between the stools of the seventy-eight breast-fed babies and those of the thirteen artificially-fed infants, except that the hæmolytic strains of *B. coli* occurred relatively more frequently in the case of the artificially-fed infants, but owing to the small number of hæmolytic strains isolated it would be unwise to lay too much stress on these figures.

Glucose Tolerance and its Value in Diagnosis (Henry J. Wood, *Journal of Metabolic Research*, vol. i, No. 4, April, 1922).—The sugar analyses of blood and urine in a series of varied cases show gradations of assimilation which may be designated as (1) strong normal; (2) normal; (3) weak normal or pre-diabetic; (4) diabetic. With all possible allowances for uncertainties, presented by renal glycosuria, toxic or infectious states, or other endocrine disorders, the simple glucose test undoubtedly reveals an important number of cases of early or latent diabetes, in which prophylactic dietary regulation is a rational procedure. Studies of the largest possible numbers of such cases over the longest possible period of time will be necessary to establish their progress with certainty, but it seems probable that many cases of diabetes may be prevented by diet instituted on the basis of glucose tolerance tests in the pre-diabetic stage.

Plague in the Orient with Special Reference to the Manchurian Outbreaks (Wu Lien Teh, *Journal of Hygiene*, vol. xxi, No. 1, June, 1922).—Subacute or chronic plague may exist among tarabagans (*Arctomys bobac*) in Mongolia and Siberia, giving rise to periodical outbreaks of bubonic plague in man, as a result of direct infection from injury due to skinning by trappers or marmot eaters. The tarabagan is easily susceptible to pneumonia plague produced by inhalation of *Bacillus pestis* in spray form. The existence of pneumonic plague carriers has been proved in the Manchurian epidemic.

Rooms where patients have died of pneumonic plague are not particularly dangerous. In all four instances recorded, sick patients travelling in railway carriages have not infected their fellow-passengers.

Disinfectants and antiseptics, even in strengths above those usually employed, have very little effect upon plague sputum. Alcohol is the surest means of sterilizing the hands and gloves in plague work. *B. pestis* has been cultivated from seemingly dry sputum of patients.

The mask is the principal means of personal protection against pneumonic plague. The problem of successful vaccination against pneumonic plague still awaits solution.

Studies in Bacterial Variability. The Experimental Production of a Mucoid Form of Bacillus paratyphosus B (E. W. Ainley Walker, *Journal of Hygiene*, vol. xxi, No. 1, June, 1922).—The experimental derivation of a *mucoid* from *Bacillus paratyphosus* B is described.

This form, though at one stage non-motile, agreed closely with the "capsulated mucoid forms" of paratyphoid B, isolated by W. Fletcher from two chronic "carrier" cases.

The mucoid paratyphoid B was highly dysagglutinable, and it would not on serological examination be identified as a paratyphoid B.

Its colonies were also entirely unlike colonies of paratyphoid B, being large, slimy, and usually dome-shaped, though at other stages of their metamorphosis they presented either an umbilication or a nipple-like elevation in the centre.

The mucoid bacillus possessed the distinctive sugar reactions of paratyphoid B.

On suitable manipulation it reverted to the ordinary form.

Anti-scorbutic Properties in Potatoes (Bezssonoff, *C.R. Academy of Science*, January, 1921).—The author carried out several experiments with guinea-pigs which showed that potatoes, fresh, raw and peeled, were quite equal to cabbage and dandelion in anti-scorbutic value, but pounded potatoes or extracted juice from them had practically no anti-scorbutic properties at all.

Malaria Control Operations in relation to the Ultimate Suppression of the Disease (C. C. Bass, *Journal of the American Medical Association*, vol. lxxix, No. 4, July, 1922).—Malaria has disappeared from large areas in this country and in other parts of the world, chiefly as a result of development of the country, including drainage and clearing of the forest, incident to agricultural and other industrial pursuits.

Malaria prevalence is slowly but surely decreasing over practically all of this country as a result of the steady march of civilization and settlement of the country.

This process may be aided and hastened by anti-mosquito measures or the proper use of quinine. Health agencies are interested in encouraging these measures.

The only part of our present malaria control activities that actually lead to ultimate suppression of that disease is permanent drainage and filling operations. All others are temporary and must be continued indefinitely, or the tendency will be toward a return of former conditions.

The cost of intensive anti-mosquito operations for malaria control is so great that they have not been applied to a sufficiently large part of the total malarious area of the country to affect seriously the total prevalence of the disease.

The cost of such malaria control as results from infected persons taking proper quinine treatment does not involve any cost over the amount that would be spent for other remedies. Therefore, it is applicable to the malaria problem of the country as a whole, and should be emphasized and encouraged by health agencies interested in malaria control.

Solitary Amœbic Abscess of the Liver (W. J. Mallory, *Journal of the American Medical Association*, December, 1920).—This is a case of amœbic abscess of the liver occurring in a patient thirty years after residence in the tropics. The illness started with malaise, mild, intermittent fever and loss of weight. An operation performed four months later disclosed a solitary hepatic abscess, with sterile pus containing no entamœbæ, on the anterior superior surface of the right lobe of the liver.

The Experimental Production of Periarteritis Nodosa in the Rabbit with a Consideration of the Specific Causal Excitant (W. H. Harris and A. V. Friedrichs, *Journal of Experimental Medicine*, vol. xxxvi, No. 2, August, 1922).—Periarteritis nodosa is a specific disease which is transmissible to the rabbit.

The lesions induced in rabbits are identical with those occurring in man and consist of exudative and degenerative processes within the walls of the smaller arteries, resulting in aneurysmal formations and thromboses.

The micro-organism inducing the disease is capable of going through a Berkefeld N filter, and is therefore to be classed with the group of so-called filter-passers.

Metabolic Studies on a Case of Diabetes Insipidus (I. M. Rabinowitch, M.D., *Archives of Internal Medicine*, vol. xxviii, No. 3, September, 1921).—In a case of diabetes insipidus studied there is no specific cause for the polyuria. An endocrine and a renal factor were found. Since the administration of pituitary extract improved not only the concentration but also the rate of excretion, it is suggested that the theory advanced that diabetes insipidus is produced by lack of some internal secretion which normally regulates and moderates diuresis by acting on the renal cells holds in this case.

Hip-joint Complications in Malta Fever (O. Cignozzi, *Riforma Medica*, July, 1921).—The author is of the opinion that in all cases of hip-joint disease which appear to be typical tuberculous processes, except that they show a tendency to heal, agglutination tests for Malta fever should be carried out. In two such cases the coxopsotitis was found to be a manifestation of Malta fever. The use of

the hip-joint was recovered in both cases, and they and others testify to the efficacy of serotherapy in Malta fever.

One or Several Species of Malaria Parasites (Bruce Mayne, *Public Health Report*, November, 1920).—The author made sixteen transmission experiments by mosquitoes, fourteen with benign tertian, and two with subtertian. Two separate donors were used in the subtertian experiments, the blood of one having had twenty-one previous examinations and the other nine, and in all cases only subtertian parasites were found. In the benign tertian the donor was examined fourteen times, and only benign tertian was found in the donor and the fourteen persons infected. Three members of a family of five were infected with *Plasmodium falciparum* and the other two with *P. vivax*. In two of the former the infection changed to one with *P. vivax* during examination.

A New Strain of Transmissible Leukæmia in Fowls (Strain H) (Vilheim Ellermann, M.D., *Journal of Experimental Medicine*, vol. xxxiii, No. 4, April 1, 1921).—According to the author a new strain of fowl leucosis has been transmitted through twelve generations of fowls. An increase in virulence was observed during its passage; this was shown in a shortening of the interval between inoculation and death. The increase in virulence does not affect the number of successful inoculations, which remains approximately constant in from 20 to 40 per cent. of the birds employed. As with former strains, the disease manifests itself in various forms, i.e., myeloid and intravascular lymphoid types. A single lymphatic case was observed. In several intravascular cases a diminution in the hæmolytic power of the serum was established. This phenomenon was absent in a number of myeloid cases.

Active immunization cannot be produced by means of the subcutaneous injection of virulent material. The finding of previous experiments that the virus is filtrable has been confirmed. The inoculation of human leukæmic material into fowls gave negative results.

Splenectomy for Rupture (N. Lopez Cross and A. J. Pavlovsky, *Semana Medica*, vol. xxvii, No. 33, August, 1920).—The authors describe the findings in the blood in a case of traumatic rupture of the spleen in a man of 35. The variations in the blood formula show that the bone marrow was able finally to substitute the spleen in its functions after the removal of the latter.

Traps for Glossina (J. O. Shircore, *Royal Society of Trop. Med. and Hygiene*, vol. xiv, No. 2, June, 1920).—The author suggests that logs smeared with some adhesive substances and propped on supports a few inches off the ground might serve as traps to catch the flies. He also suggests that the sand in the shelter be mixed with a poisonous chemical, but it has not yet been proved that this would prevent the emergence of the adults.

Peritonitis in Typhoid (N. Svartz and R. Hanson, *Acta Medica Scandinavica*, November, 1920).—In a case of peritonitis in a woman of 26, the diffuse purulent peritonitis developed apparently from the spread of the inflammation through the bowel wall, as no trace of perforation or of gas could be discovered, no fæcal odour, no colon bacilli, and no signs of injury of other viscera. In the forty or fifty cases on record the peritonitis was purulent in only ten. About 25 per cent. of the patients recovered after operative treatment. Typhoid bacilli were demonstrated in the peritoneal effusion in four cases.

Bubonic Plague in Children (Guinon and de Pfeffel, *Bulletins de la Société Médicale des Hôpitaux*, Paris, February, 1921).—The author describes two cases of bubonic plague in children. In one the child, 3 years of age, died, but the other, a little older, had merely redness of the throat and very slight reaction in a few glands. There had been a typical case in an adult in the same building. Inoculation of animals gave conclusive results.

The Endocrines in Pellagra and Pellagroid Syndromes (Eugenio Bravetta, *Archivio generale du neurologia e psichiatria*, March, 1920).—The author gives a brief review of the studies of pellagra and the conclusions he has come to. He eliminates the term pseudo-pellagra altogether. The disease is distinguished by skin disturbances, gastro-enteric disorder, nervous symptoms, the most distinct of which is the spinal spasmodic syndrome, and psychic symptoms. Among the latter are anxiety and pain, affectivity remains intact, there is clearness and orientation, memory is usually fairly well retained, there is tendency to suicide of a negativistic character. A marked feature is the clear recognition of his own disease by the patient. Other psychic disorders show similar symptoms, such as the erythema in alcoholic psychosis, or the pellagra may be present with other psychic disorder. The disease is found to return even after a long remission. Like beriberi, scorbutus and the œdema of famine, it is probably due to a one-sided diet. This causes lesions of the nervous system and of individual organs. The results are chronic inanition, interference with digestion and assimilation, modification of the endocrinous system with hyperadrenalism.

Foot-and-mouth Disease in Man (H. Sieben, *Deutsche Medizinische Wochenschrift*, vol. lvi, No. 43, October, 1920).—The author describes the case of a woman of 38, who had been milking a goat that had sores on the udder from foot-and-mouth disease. She presented a painful eruption on the hands. In the palms and on the volar surface of the fingers there were numerous nodular and very painful infiltrations, ranging from the size of a pea upwards. The smaller nodules were more recent and were a pale red colour, and were less painful than the older lesions, while many had at their summit a flat, white vesicle. The largest nodules were almost black, the vesicles containing very little fluid. The patient complained of fever, headache and general discomfort. The mucous membranes were not involved at all, and there were no similar eruptions on other parts of the body, except on one big toe. Improvement followed on the use of antiseptic dressings.

Treatment of Hereditary Syphilis with Suppositories of Novarsenobenzol (E. G. Melon, *Gazette des Hôpitaux*, p. 1306).—An examination of a baby 3 months old revealed mucous patches on and around the anus, a band of alopecia, and engorgement of the pericranial veins indicating increased tension of the cerebrospinal fluid. Under mercurial inunction the mucous patches disappeared. The treatment was supplemented by hypodermic injections of mercury biniodide. These were badly tolerated, leaving hard nodules at the site of inoculation. Van Swieten's fluid was administered by the mouth, but the child cried incessantly. An attempt to give a solution of novarsenobenzol by the rectum resulted in expulsion. The novarsenobenzol was then administered in suppositories (0·10 grm. in cocoa butter) at bedtime at intervals of one week. Three days after the second dose sleep returned. Two more doses were administered, and the weight increased rapidly, the hair commenced to grow, and the engorged veins disappeared.

Abstracts and Reprints.

REPORT OF A SERIES OF CASES OF AN UNUSUAL ERUPTIVE FEVER.[1]

By Major J. E. H. Gatt.

Clinical Features, Seasonal Incidence, Distribution, &c.—Between the middle of August and the end of September ten to eleven cases of this nature came under our observation at the Curragh, showing, individually or collectively, the following signs and symptoms:—

(*a*) Incubation period, as yet uncertain.

(*b*) Sudden onset, with frontal headache, conjunctival injection, more or less sore throat, with or without coryza. In one or two cases epistaxis; very moderate fever, with vague joint pains.

Within a few hours a rash appears, generally on the trunk, deltoid region, and proximal segments of the limbs. In a few cases the forehead and face are involved in a dull red flush, which is almost always uniform. In the latest cases observed, the rash was obviously most developed in the hairy parts, the neck, the armpits, the front of the chest, and all parts most subject to pressure.

The coarse appearance of the rash certainly suggested rubella; but on passing the finger one could not help being struck with its absence of depth, except in very few places. A magnifying lens showed that by far the most extensive lesion was an erythema, chiefly affecting the pores of sweat glands, and the base of hairs. A few stray papules also were discernible here and there, with, in most cases, one or two petechiæ. The general colour of the rash was dull red.

All cases showed natural diaphoresis, and in some there was also skin irritation. On the whole the illness lasted three to four days. Up to date no trace of desquamation was observed, even in the most extensive rash. The last case was somewhat unusual in that the temperature was only 99° F. on the first day and remained normal afterwards; further, whereas in all previous cases the rash disappeared almost completely after forty-eight hours, in this case it was persistent on the third day, and became semi-purpuric (not disappearing on pressure).

It is well to remark here that this patient had been under treatment for a chronic arthritis for a week, and three applications of dilute picric acid dressings had followed a blister; it was even suggested that the peculiar rash was a drug rash. The urine, however, was normal, except for an excess of urates.

There were no complications, but one case from another source, which had no connection whatever with the above, developed higher fever, with several glandular enlargements, and a leucocytosis with seventy-three percentage mononuclears. There were no Koplik's spots nor otherwise any glands to be felt.

Bacteriological Findings.—Throat swabs, collected as early as possible, yielded mostly Pfeiffer's bacilli, with some associates, mostly common diphtheroids, Gram-positive diplococci, or *Micrococcus catarrhalis*.

(1) Agglutination tests were made against Pfeiffer's bacillus isolated from some of the cases, and the positive results up to 1 in 100 in three cases were obtained.

(2) There was no appreciable change in the blood elements (with the exception of the case already referred to), but if any, it was in the sense of a moderate leucocytosis.

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[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxix, July, 1922.

THE LIMITATIONS OF INTRAVENOUS MEDICATION.[1]

By Carl Voegtlin, Ph.D.

Intravenous medication is not of modern origin. Some attribute it to Christopher Wren, who, in 1656, made experiments on dogs. In 1657 the first intravenous injection was made on man. After that all conceivable substances were injected indiscriminately.

The modern application of intravenous medication began with Baccelli's introduction of the intravenous injection of quinine as a routine treatment of malaria. This was followed by Credé's treatment of septicæmia by means of intravenous injection of colloidal metals. About twenty years later (1910) the discovery and use of arsphenamin in the treatment of syphilis revolutionized medical practice in this respect. Intravenous injection then speedily became more popular, and most of the respect for the ever-existing possibility of dangerous reactions resulting from intravenous therapy then vanished.

Within recent years the method of intravenous injection has been employed to other drugs and other diseases, on the assumption that it is followed by a more powerful therapeutic effect than is administration of the drug through other channels, though the intravenous administration of arsphenamin was simply an attempt to avoid pain and local reaction, and that it was not introduced in order to increase the therapeutic effect. Data furnished by Fordyce, Craig, Harrison, Wechselmann and others add assurance of the therapeutic efficiency of intramuscular and subcutaneous injection. The parasitical effect of injections of arsphenamin and neoarsphenamin given intramuscularly has been shown to be as good as that of the same dosage given intravenously.

It has been shown that arsphenamin when given intravenously exerts no more powerful parasiticidal effect than when injected intramuscularly, and that the intravenous method was chosen in order to avoid local reactions, but there are some drugs which, under certain conditions, give better therapeutic results when injected intravenously. The intravenous injection of quinine in malignant malaria, of strophanthin in certain cardiac cases, of diphtheria antitoxin in severe diphtheria is absolutely indicated as an emergency measure.

Another example of the superior therapeutic effect of intravenous medication is the administration of salt solutions in severe hæmorrhage.

With intravenous medication, the dosage required to cause a certain therapeutic effect is, with several drugs, considerably smaller than if the treatment is given by other channels. Epinephrin, for instance, produces a much greater rise in blood-pressure when injected into the vein than when given intramuscularly. On the other hand, the pressor effect is much more prolonged in the latter case, on account of the more gradual destruction of the drug by oxidation. If, therefore, we wish to counteract the depressing effect of certain drugs on the blood-pressure, such, for instance, as arsphenamin, we choose the intramuscular injection of epinephrin in preference to the intravenous; and this principle holds for certain other drugs with symptomatic or etiotropic action.

Safety.—Asepsis is an essential requirement. Also, care should be exercised not to inject any air, solid particles or oil droplets, on account of the danger of embolism, nor to allow any of the drug to escape into the perivascular tissues in case such solutions cause local irritation. Thrombosis sometimes occurs, which makes the vein useless for further injections. Intravenous medication brings the drug into immediate contact with some vital organs, such as the heart and the central nervous system, and the drug concentration to which these organs are exposed is much greater than if the same doses had been given by the usual channels. All drugs are poisonous in higher concentration, and so the rate of injection of any drug must be slow enough to give the blood a chance to distribute it as effectively as possible. No general rules can be laid down to fit every case; suffice it to say that the number of untoward reactions to arsphenamin have been very materially reduced by the now prevalent use of dilute solutions, given slowly by means of the gravity method.

It appears that a considerable amount of evidence has accumulated in recent years which indicates that the nicely adjusted equilibrium of the blood and those of the easily accessible tissues may be temporarily upset by intravenous medication; and this disturbance may give rise to undesirable symptoms and even cause death. These symptoms are due to various causes, some of which have already been clearly recognized. In many cases, untoward reactions can be avoided by introducing the drug solution at a slow rate, which permits the protective mechanism of the blood and tissues to operate efficiently; whereas, if the injection rate is too fast, this mechanism breaks down, and symptoms appear as visible results of the disturbance of the chemical or physical equilibrium of the blood and tissues.

Having seen that intravenous medication is not necessarily superior therapeutically to other modes of drug administration, we should strive to simplify the technique of the administration of drugs wherever possible, in order to avoid the necessity of the injection of the medicament directly into the circulation. The subcutaneous injection of morphine and similar drugs is an exceedingly simple procedure. Would it not be a step forward if such drugs as arsphenamin or its substitutes could be given subcutaneously? During the past year, in collaboration with Miss Dyer, Dr. Johnson and Mr. Thompson, I have studied such a preparation experimentally, and so far it meets all the essential requirements. The drug is now being tested, and,

[1] Abstracted from the *Journal of the American Medical Association*, August 5, 1922, vol. lxxix, No. 6.

should our hopes be fulfilled, I believe that it will have a considerable effect on the practical problem of the control of syphilis.

I believe that it should be emphasized in this connection that intravenous medication, of necessity, places decided restrictions on the treatment as well as on the prevention of certain diseases, owing to the more or less difficult technique inherent in this method, whereas a simple technique, such as the subcutaneous injection, would make it possible to put a larger number of syphilitics under the controlling influence of the arsenicals. Again, the prevention of malaria is practicable by means of the oral administration of quinine, where it would hardly be a feasible proposition if quinine had to be injected intravenously.

Therefore, every effort should be made to render the administration of such drugs as simple and safe as possible, without, however, sacrificing their therapeutic efficiency. Intravenous medication, to my mind, will never serve this purpose, and will always have a more or less restricted field of usefulness.

CARBON TETRACHLORIDE IN HELMINTHIASIS. A PRELIMINARY NOTE.[1]

By J. Borland McVail, M.R.C.S., L.R.C.P.

In the Journal of the American Medical Association of November 19, 1921, there appeared a note by Maurice C. Hall on the use of carbon tetrachloride for the removal of hookworms in animals. Dr. Hall is the senior zoologist, United States Bureau of Animal Industry, and he found this drug to be a powerful anthelmintic in dogs, and suggested its trial in human uncinariasis.

Carbon tetrachloride (CCl_4) is a clear, heavy, colourless, volatile liquid; specific gravity 1·599 to 1·600. It should be kept in dark, amber-coloured stoppered bottles in a cool place. It may be contaminated with either chlorine or hydrochloric acid. "It should yield no darkening in colour when shaken with an equal volume of concentrated sulphuric acid, indicating the colour of foreign chlorine compounds. When shaken with an equal volume of distilled water, the aqueous solution when separated should give no acid reaction towards blue litmus paper, nor should it produce a turbidity on the addition of silver nitrate solution indicating the absence of hydrochloric acid." (Squire.) The retail price of carbon tetrachloride in Calcutta at the time of writing is two rupees per pound.

I could find no record of the internal use of this drug in human beings, though Dr. Hall had himself swallowed a dose of 3 c.c. in capsules without experiencing any ill-effects. It was therefore thought advisable to begin tentatively by giving a dose of 10 minims in a child of 12 and 30 minims in the case of an adult. I soon found that these doses were too small to be effective, and also that children stood the drug remarkably well. I have recently given two well-grown Indian children of about 12 a drachm each on two successive days without ill-effects. In old people it is necessary to be more careful. A dose of 60 minims in a very old man was followed by irregularity of the pulse and slurring speech. Seventy minims on two successive days is the largest dose I have yet given to an adult, but it is possible that in the case of a fairly well-nourished man this may be considerably below the maximum.

Carbon tetrachloride is a soporific. At a certain leper asylum fifty-one cases were given a 60-minim dose one evening, and all slept so soundly that a burglar, who must have been a born opportunist, was able to remove the contents of the rice godown during the night.

It does not appear to aggravate albuminuria, and may be given with confidence in cases of kala-azar complicated with ankylostomiasis during the remissions of temperature, though kala-azar cases stand chenopodium badly.

Carbon tetrachloride is of little value against Ascaris, Trichiuris and *Hymenolepis nana*, and I have no facts yet as regards its action on *Tænia solium* and *saginata*. On the other hand, this drug appears to be almost specific for threadworms. In thirteen cases Oxyuris worms were found in the stools after a single treatment with carbon tetrachloride, and in four cases after a double treatment, though Oxyuris ova had been found during the previous microscopic examination only in three cases out of the seventeen. Threadworm disease is apparently more prevalent in Calcutta than has been realized, and as its treatment has up till now been difficult and troublesome, I recommend this drug to the attention of practitioners.

Since the above went to press I have had the advantage of a conversation with Dr. Victor Heiser, Director for the East of the International Health Board (Rockefeller Foundation). He informs me that carbon tetrachloride is on trial by Rockefeller investigators in South America, and that several cases of what was apparently acute yellow *atrophy of the liver have followed its use*. Of the conditions prevailing and the dosage used he was not at the time of speaking aware. Until this matter is cleared up it would obviously be unwise to employ carbon tetrachloride as a routine standard treatment.

[1] Abstracted from the *Indian Medical Gazette*, August 1922, vol. lvii, No. 8.

Original Communications.

CHOLERA EPIDEMICS IN JAPAN AND IN HER COLONIES.

By Professor . M. Miyajima.
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I.

Introduction.

From the point of view of international sanitation and of prophylactic measures, plague and cholera are the two most important epidemics which annually occur in Far Eastern countries. The sanitary organization of the majority of these countries still leaves much to be desired, and their anti-epidemic measures are far from effective. Japan, owing to her geographical position, is in constant touch with her neighbours by trade and communications, and is consequently exposed to the menace of plague, cholera and similar contagious diseases. In the southern part of Asia plague or cholera prevail almost uninterruptedly, and the existing disorganization in Siberia makes it most difficult to enforce effective sanitary measures in that vast territory. The movement of refugees further complicates matters by spreading typhus fever and relapsing fever to contiguous countries, just as in Eastern Europe at the present moment epidemics are spread beyond the frontier of European Russia, and consequently Chosen and Manchuria are in constant danger.

I propose to indicate in the course of this article some of the more salient facts relating to cholera in the Far East, and the measures taken by the Japanese authorities to prevent the spread of epidemics.

II.

Cholera Epidemics in Japan.

During the last decade cholera epidemics broke out in Japan in 1912-1913, in 1916-1917, and in 1919-20. The first case of cholera in 1912 occurred on August 29 in a coal transport ship in a port of the Nagasaki prefecture. The epidemic spread to the island of Kyushiu and along the coast of the Inland Sea, and thence by direct communication by ship to the district along the Bay of Tokio, finally subsiding in February, 1913. During the whole period of the epidemic 2,798 cases were reported, 1,705 of which were fatal.

Before the first case of cholera was reported in Japan in 1912, an epidemic of cholera occurred in Shanghai and Hong-Kong in the early summer of the same years, although there was no official report to that effect. On August 26, when the existence of an epidemic of cholera in Shanghai became known, the Department for Home Affairs of the Japanese Government issued a notice declaring Shanghai to be an infected area. On August 11, in the Russian steamer *Benza*, which arrived at Nagasaki from Shanghai, one case of cholera was discovered, and in ten other steamers which came into Japanese ports from Shanghai or Woosung between that date and September 16, twenty-seven cholera cases were found. There is, therefore, little doubt that the epidemic of 1912 originated from Shanghai.

In the early part of December, 1915, cholera broke out in Manila and spread to other islands. The climax of the epidemic was reached in July and August, 1916, the outbreak gradually subsiding and dying out in January, 1917. The total cases reported in 1916 were 12,847, and the deaths, according to the Report of the Health Department of the Philippine Islands, were 7,986. Cholera cases were also reported in Hong-Kong, Macao, Shanghai, Bangkok, Singapore, Calcutta, Bombay and a few other places in the Far East.

Among the steamers coming from abroad to Japan, a cholera case and a bacillus carrier was first found on board the steamer *Hawaii*, which came from Manila to Yokohama on July 27, 1916. She was followed by six other boats with fifty-one cases and eight bacillus carriers.

In 1916 the first case of cholera was found in Yokohama on August 12, and the epidemic had spread to forty prefectures by March 26, 1917, with 11,265 cases and a total of 6,801 deaths. This epidemic, which was considered the most serious outbreak in recent years, spread on the one hand to the adjacent prefectures, with Yokohama as the centre, and on the other hand to the island of Kyushiu, with Nagasaki as the centre. From Nagasaki, the epidemic extended to the prefecture of Osaka and to the coast along the Inland Sea.

Again in March, 1919, information was brought of a cholera epidemic in Siam, and in May and June it spread to the Chinese provinces of Swatow and Fukien. About the same period there was a further outbreak of cholera in Manila, in the Philippine Islands, which spread in July to Shanghai, Nanking, and practically all parts of Southern China. It further extended to Northern China, especially in Newchang, Dairen, Peking and Manchuria, and in August reached Vladivostok and the Maritime Province. At about the same time this epidemic further spread to Chosen, where it assumed very serious dimensions. From this it is obvious that Japan was simultaneously menaced from three directions. As the result of this situation, the Government declared Swatow, Shanghai, the Philippine Islands and other ports to be cholera-infected districts from July 7 to September 6, 1919, and instituted very strict anti-epidemic measures to prevent the possible entry of cholera.

The first case of cholera in 1919 was found, by quarantine inspection, on September 22 in a steamer which reached Japan from Shanghai. Cholera cases and bacillus carriers were similarly found in ships at the ports of Nagasaki, Kobe, Yokohama and Tsuruga. The total number of cases reported was seventeen cholera cases and twenty-nine bacillus carriers.

In spite of the precautions taken by our authorities, a cholera case was reported in Moji on August 12, and the epidemic spread to other districts. Cholera was also brought from Formosa to the Okinawa prefecture. By the end of the year the cholera epidemic extended to twenty prefectures, the cases amounting to 2,912, including 915 deaths. It was especially severe in the prefecture of Okinawa, where 2,505 cases were reported, with 638 deaths, this being 85 per cent. of the total number in Japan. The rapid spread of the epidemic in Okinawa was partly due to the geographical character of that prefecture, which is composed of small islands scattered over a long distance, and partly to the prevalence, at the beginning of the epidemic, of a severe and continuous storm, which made communications between the islands extremely difficult. For these reasons it was very difficult to fight the epidemic owing to the small supply of disinfectants available and to the lack of competent medical staff in the island to cope with the situation, so that effective work was rendered practically impossible.

Even as recently as 1920 there was an outbreak of cholera in the Far East, especially in Bangkok, Calcutta, Bombay, Manila, a number of cases occurring also at other places. In Shanghai cholera cases were reported, and on July 28 it was discovered that an English steamer, bound for Moji, which touched Shanghai contained cholera cases and bacillus carriers. In this steamer and in six other steamers which followed it there were six cases and ten bacillus carriers. As all these steamers came from Shanghai, the Japanese Government, on August 13, officially declared that city, including Woosung, to be an infected district. By this time, however, cholera had already appeared in Kobe, spreading first along the coast of the Inland Sea, and then to twenty-six of the neighbouring prefectures. There were in all 6,967 cases, of which 2,112 were fatal, and the epidemic did not subside till the early part of December, 1920.

The anti-epidemic measures adopted by the Japanese Government for fighting cholera are as follows:—

A.—Preventive Measures carried out by the Japanese Government against the Entry of Cholera from Abroad.

In order to prevent the spread of cholera from abroad into Japan, constant investigations are made into the epidemic situation in adjacent countries. When cholera is ascertained to exist in a district, an order is issued declaring that district to be infected, and all steamers coming from ports of the district in question are inspected, a fæces examination being enforced in the ports of entry. The authorities endeavour in this manner to find the patient and the bacillus carriers. The ports already provided with quarantine stations are ten in number (Nagasaki, Karatsu, Kuchinotsu, Moji, Kobe, Osaka, Yokkaichi, Yokohama, Tsuruga, Hakodate), but at periods of epidemic such additional quarantine stations are temporarily established as may be considered necessary in order to cope with the situation.

B.—Preventive Measures adopted by the Japanese Government in Japan.

(*a*) The Bureau of Health of the Department for Home Affairs reports from time to time on epidemic conditions abroad to each prefecture, in order that the officials may engage in a preventive campaign and distribute pamphlets warning the public of the precautions it is necessary to take.

(*b*) The Bureau dispatches its staff health officials to the various places and co-operates with the local officials in instituting preventive measures. Furthermore, the epidemic situation of any prefecture is reported promptly to those other prefectures with which it is in most frequent communication.

(*c*) Health officials are stationed by the Department for Home Affairs in prefectures most frequently exposed to the entry of infectious diseases; extra officials being dispatched thither in case of the epidemic being brought into the prefectures from abroad.

(*d*) To meet the expenses of the anti-epidemic campaign in the prefectures, the Central Government always bears one-sixth of the total expenditure.

C.—Preventive Duties of the Governments of Prefectures.

(*a*) To undertake educational propaganda among the general public on hygiene and sanitation in order to prevent epidemic.

(*b*) To make a prompt report on epidemic conditions in those prefectures where the epidemic is found, and to adopt measures in co-operation between adjacent prefectures.

(*c*) To establish temporary quarantine stations in addition to the national quarantine stations and branch offices at ports.

(*d*) To prohibit the discharge of fæces into the port waters.

(*e*) To encourage anti-cholera vaccination among the people.

(*f*) To discover cholera cases and the bacillus carriers in their early stage by fæces examination.

(*g*) To quarantine and isolate the cholera patients and the bacillus carriers.

(*h*) To ensure a free supply of good water in those districts where no waterworks exist.

III.

The Cholera Epidemic in Chosen.

Cholera epidemics in Chosen have a long history, recurrence having been quite frequent among the people of the "Hermit Kingdom." Since 1900 there have been six severe epidemic outbreaks in the country, and of these the epidemic of 1919 was one of the severest in all the history of this destructive disease.

This epidemic found its way into Chosen from two directions: from Manchuria on the one hand,

and from Vladivostok on the other. The former attacked the West Coast district and the principal rivers within this district which were in very frequent communication with the infected territories, the infection then spread into the interior; the latter was conveyed toward the end of August and at the beginning of September by shipping from Vladivostok, and spread to the district along the East Coast. Another source of infection originated at Mukden, and thence along the railroad into Chosen.

From the discovery of the first case on August 12 until December 28 (altogether 142 days) the total cases reported were 16,991, with 11,084 deaths. The bacillus carriers numbered 1,070.

The preventive measures adopted by the Government-General of Chosen were as follows:—

Because of the cholera epidemic in Southern China the authorities, recognizing the necessity of an anti-cholera campaign, took vigorous measures to prevent the entry of the disease into the country. On July 15 the Government issued a special order to the provincial officials instructing them to enforce a quarantine of ports, to regulate foodstuffs, to inspect houses, and to demand clinical reports from the medical men. When cholera cases increased in Manchuria, the Government declared Fukien, Shanghai, Chefoo, Newchang and other coast districts of Manchuria to be infected districts, and enforced strict quarantine measures against all communication from these infected areas. On August 9, at the station of Shanghai, a railway quarantine station was opened.

In addition to these Government precautions, the authorities also issued general instructions to the public concerning preventive sanitary measures against the epidemic, and ordered the adoption of plans for an anti-cholera campaign, which included an examination of the fæces of the persons who came from the infected districts. After the actual outbreak of cholera in the country, they regulated and controlled river water for domestic use, as well as fishing and swimming in the infected district.

At the same time the Government-General of Chosen set up, in addition to the normal sanitary organization, a temporary committee for the prevention of epidemics, in order to unify more effectively the work in the different prefectures. It also established travelling epidemic corps supernumary to the stationary corps, and dispatched them to the infected areas to cope with the grave situation then existing throughout the country.

The number of corps and their staffs were as follows:—

	Number	Number of doctors	Assistants	Nurses	Total
Stationary epidemic corps	37	168	77	107	352
Travelling epidemic corps	17	37	19	—	56

While the authorities enforced preventive measures, the Travelling Epidemic Corps which inspected the infected areas were instructed to enforce anti-cholera vaccination in these areas. The total number of vaccinated persons during this period was 1,444,318. The results were favourable as shown in the following table:—

	Number of persons who received one inoculation after ordinary method	Number of persons who received two inoculations after ordinary method	Number of persons who received one inoculation of 2 c.c.
Total number of persons	460,684	566,670	66,475
Patients	502	126	17
Morbidity	0·109%	0·022%	0·025%
Bacillus carriers	164	155	3
Rate of bacillus carriers	0·036%	0·027%	0·005%
Deaths	266	41	2
Death-rate	53%	32·5%	11·7%

(*Note.*—It was found that it was practically impossible to administer two inoculations to the sailors and fishermen who were constantly on the move, and therefore the dose of 2 c.c. was administered all at once, i.e., one complete vaccination. It was found that this method produced only a slight reaction, and the result was more satisfactory than the ordinary method.)

In the year following the 1919 epidemic in Chosen there occurred an outbreak of cholera in the district along the Yungtzke River, when Formosa and Japan proper were also infected. The Government-General of Chosen thereupon immediately adopted anti-cholera measures to prevent the spread of the pest to Chosen, and discovered bacillus carriers in the course of port medical inspection. From June 29, when the first case appeared, up to November 20, there were 24,229 cases, with 3,675 bacillus carriers and 13,570 deaths.

For the work of the anti-cholera campaign in Chosen during the epidemic of 1920, the sanitary authorities took the situation in hand without organizing the special committee appointed for the previous epidemic, and issued instructions to the prefectures to cope with the epidemic. The prefectural authorities adopted the following measures:—

(1) Quarantine of the ports.

(2) Inspection of ships and trains.

(3) Public campaign of education in sanitation.

(4) Search for patients and bacillus carriers and subsequent isolation.

(5) Disposal of the corpses.

(6) Disinfection of the dwellings where cholera cases had been found, and prohibition of communication.

(7) General application of anti-cholera vaccination.

Again in 1921, as it was feared that there might be a recurrence of the epidemic as the result of bacillus carriers in the severely infected area and in places where the disease was very late in subsiding, an examination of the fæces of about 12,000 persons in the area was undertaken by the sanitary authorities, but fortunately no bacillus carriers were found in the persons examined.

In June, however, there was another outbreak of cholera in Shanghai, and on July 21 a typical cholera case was discovered among the Japanese inhabitants in Shanghai. Furthermore, it was reported that there was a cholera epidemic in Japan proper. The authorities thereupon took steps to administer anti-cholera vaccination to the population of about 50,000 who lived in the districts in constant communication with abroad, and particularly to those persons who were connected with the fishing and shipping industries (stevedores for example), as well as to restaurant and innkeepers and their employees. Moreover, the authorities launched a campaign of education in sanitary measures throughout the prefectures. On July 25 Shanghai was declared an infected district, and a quarantine of ships coming in from Shanghai was enforced. When the epidemic spread into Moji and Shimonosaki in Japan, it was decided to establish temporary quarantine stations at the ports, eight in number, namely, in the prefectures of Keisho-nando and Keisho-hokudo, in addition to the quarantine stations already established at Fuzan and Moppo. Through these numerous stations the authorities took measures to prevent the importation of cholera by steamers and fishing boats communicating with the infected districts.

By the quarantine measures thus enforced one bacillus carrier was discovered at Fuzan on October 12 in a fishing boat which reached the port, and on October 24, at Hogyoshin, another bacillus carrier was likewise discovered in a fishing boat. These cases were immediately isolated. On account of the strenuous measures thus adopted, the authorities were successful in preventing a cholera epidemic in Chosen during this year.

The difficulties met in Chosen in the prevention of cholera epidemics were in each case numerous; the population has no adequate knowledge of public sanitation, and, in addition to this, owing to their traditions and superstitions, they dislike the isolation and disinfection of the members of a family even if they are suffering from the disease. In some cases they move into the mountains or a remote district where it is difficult for the authorities to reach them, with the result that the entire family is infected. Furthermore, in a family, the neighbours and relatives assemble round the patient's bed and share the food of the family. When the patient is suffering from an infectious disease, it is obvious that the spread of such a disease is inevitable. These conditions arose from the inadequate organization both of medical education and of the sanitary administration of the country which existed prior to the annexation of Chosen to Japan.

The Government-General of Chosen, therefore, took the situation in hand and established one medical school in Seoul and twenty-one charity hospitals in Seoul and other important cities; in the villages public doctors were stationed, whose duty it was to advise the people on health matters, so that the population might have the benefit of modern medical science.

In a time of epidemic even these provisions were found inadequate, and the Government-General in 1921 adopted the plan of increasing the facilities for medical work by building more hospitals. The total budget for 1921 for the hospitals in Chosen was 11,300,000 yen. Under the new plan the establishment of thirteen new charity hospitals in the provinces, as well as the improvement and extension of those already existing, was proposed. The medical staff, which now consists of 190 doctors and pharmaceutists, is to be increased by 169 new doctors and pharmaceutists. In open ports five new quarantine officers will be stationed, in addition to three already on duty. The experts and officials in charge of medical affairs under the Government-General and Provincial Governments, now numbering fourteen, will also be increased by fifty-two. For people living in remote places and unable to attend the charity hospitals, thirty public doctors are to be newly appointed, in addition to 186 public doctors already on duty at different places. This plan, which requires an outlay of about twelve million yen, will be completed in the course of the present and next fiscal years. Moreover, the present Sanitary Section of Police in the Bureau of the Government-General will be expanded both in organization and in the scope of their work, while medical research and investigation and the manufacture of sera and vaccines, now carried on by different institutions, will be unified under the management of a sanitary research laboratory to be newly established. A central sanitary association, composed of officials and of private individuals interested in medical and sanitary work, will also be formed as an advisory organ for the Government, so that the authorities may seek its opinion on medical and sanitary matters.

IV.

The Epidemic in Formosa.

In Formosa there have been frequent outbreaks of cholera in the last two decades. Epidemics occurred on four occasions, the severest of all being those of 1919 and 1920, which brought the total cholera cases up to 6,505, and the deaths to 4,371. Formerly cholera epidemics were always traceable to the infected localities of Southern Asia and China, and the epidemic of 1919 was also traceable to China. In May, 1919, there was an outbreak of cholera in Swatow, and in June in the district of Fukien. The authorities took every precaution to prevent the importation of cholera into Formosa, but on July 7 there were ten or more cases reported in the Pescadores, a group of islands at the southern end of Formosa, and on July 8, in a steamer which arrived at Kiirun from Fukien, a case of cholera was found, which was followed by other cases at Kiirun and in the Taihoku districts. Finally, the entire territory was infected. During the epidemic, which finally subsided in December, the cases reported were 3,835, with 2,696 deaths.

The epidemic of 1920 started suddenly in a little village of the Tainan prefecture in the early part of

April, and it was thought to be a recurrence of the cholera of the previous year. As effective preventive measures were taken at the outset on the part of the sanitary authorities in the village, the disease gradually subsided before July, but there was a revival afterwards owing to a heavy storm and flood which inundated the entire village, making it extremely difficult to exterminate the epidemic. As the result of this unfortunate occurrence, there was a gradual spread of cholera to other territories in the south as far as Takao and to the central section as a whole. The total cases numbered 2,670, with 1,675 deaths, the epidemic finally subsiding in December.

Preventive measures were adopted to enforce the port quarantine, to discover and isolate the patients and to prohibit communication with infected groups. Other measures were disinfection, the control of drinking water and foodstuffs, the prohibition of fishing and swimming in the waters of the infected districts, a popular campaign of education in preventive measures against cholera, and a general application of anti-cholera vaccination.

It had been decided subsequent to the 1919 outbreak to take more effective measures to discover the bacillus carriers, in addition to the above precautions.

In the epidemic of 1920, therefore, the following measures were adopted and found quite effective:

(1) Fæces examination in the case of persons travelling from an infected district or its vicinity to another district.

(2) Disinfection of the hands of all the travellers at the stations of the infected district or its vicinity by sanitary officers stationed there with disinfecting material.

(3) Enforcement of the quarantine of trains in stated districts by means of medical officers and assistants, and inspection of the condition of health of the travellers.

(4) By arrangement with the Department of Home Affairs, the placing of medical officers on board ships making regular trips between Japan and Formosa, who during the voyage might perform the fæces examination so as to prevent the transmission of the disease.

The regulations were discontinued as soon as the epidemic subsided, but the authorities retained the fourth provision for placing medical officers on ships but without continuing the port quarantine.

In order to prevent the entry of cholera from abroad, the authorities took special precautions with regard to ships coming from the southern part of Asia and China. They constantly watched epidemic conditions in those territories, and if there were indications of an epidemic outbreak, they declared these territories to be infected districts and advised preventive vaccination for the passengers before they came on board. Medical officers were placed in those ships not already provided with them.

On some occasions medical inspectors were sent on board to carry out the fæces examinations of the passengers and crews. In cases where patients or bacillus carriers were found these were isolated, and the ships were disinfected and retained at anchor for five days.

V.

The Epidemic in the Kwantung Leased Territory.

There have been several cholera epidemics along the coast of Southern China since June, 1919, especially violent outbreaks occurring in Shanghai, Swatow and Fukien. The authorities of Kwantung Leased Territory, on being informed of these epidemics, took every precaution to prevent their spread into the territory. On July 7, however, a case of cholera was discovered in the *Kobe Maru*, which arrived at Dairen from Shanghai. From then till September 6 fifteen further cholera cases were discovered in twelve ships which were subjected to the quarantine inspection. Although most of these ships had come from Shanghai, Newchang and other ports in China, the importation of cholera into the territory was checked for the time being by the stringent quarantine measures adopted.

On the other hand, the epidemic which raged in Southern China spread into Chinese territory, where there was no anti-cholera campaign, especially in the older quarter of Newchang, and extended thence to adjacent villages. In the month of June forty-one ships, and in July thirty-five ships, were reported to have arrived at Newchang from Shanghai, Nimpo, Swatow and Hong-Kong without any quarantine examination. In Newchang a large number of cases characterized by emesis and diarrhœa were discovered in the early part of June, but the Chinese authorities took no action on the ground that these cases were not true cholera. It was not till July 17 that they issued a report stating that there had been fifteen cholera cases with eleven deaths. By the end of July it was said that there were 304 cholera cases with 189 deaths in Newchang.

The cholera epidemic which raged in Newchang spread, owing to constant communication, to other Chinese territories on the one hand, and to Kwantung Leased Territory on the other. It was severest at Dairen, with 1,291 cases reported.

The most difficult problem to deal with in this territory was the total lack of knowledge of sanitation among the Chinese coolies, who left the diseased bodies of 500 cholera patients in the open fields without burial. As it was midsummer, there swarmed around these bodies numerous flies which were instrumental in spreading the disease. It is the custom among the poorer classes of Chinese to leave corpses for the beasts and birds to devour. Fear of disinfection and isolation favoured this practice, the danger of which is obvious at a time of epidemic. As the result of these various difficulties, the total number of cases reported in

Southern Manchuria from the beginning of the epidemic till its end in December was 12,254, of which 6,376 were fatal.

As there are no laws or regulations in China with regard to census registration or vital statistics, nor any competent organization for their investigation, it is extremely difficult to ascertain exact figures relating to the epidemic; but, according to certain information which it has been possible to verify, there were in Northern and Southern Manchuria about 44,196 cholera cases among the Chinese and 637 among foreigners (exclusive of Japanese), making a total figure of 44,833, with 27,088 deaths.

In conducting the anti-cholera campaign of 1919, the Kwantung Territorial Government first established its headquarters at Mukden, but later removed it to Dairen, and thence directed the work of prevention. The local organizations included several quarantine stations, and officers were appointed to fight the disease in co-operation with the inhabitants of the territory. For this purpose the authorities felt the necessity for increasing the number of medical officers and also for providing additional police. They therefore appointed 138 new police officers for sanitary duties and fifty-eight medical officers from Japan.

The following steps were taken at Kwantung to fight against the spread of the epidemic:—

(1) In order to discover patients and bacillus carriers on ships coming from the infected ports, the Marine Bureau was directed to arrange for a fæces examination of all passengers and crews.

(2) Popular education in sanitation was carried out by distributing circulars on hygiene and sanitation.

(3) Voluntary anti-cholera vaccination was encouraged.

(4) When necessary, measures were taken to prohibit the use of river water, of fishing, swimming and collecting seaweed, and the transportation from infected districts of fish and vegetables, and particularly of the fæces. An anti-fly campaign to check the spread of the disease was also encouraged.

(5) In order to restrict the movements of persons working in the inns and restaurants, orders were issued that isolated sleeping quarters should be provided for the workers by the proprietors of such establishments.

(6) Measures were taken to discover patients in the early stages of infection by the inspection of trains and ships, by house to house medical inspection, by the medical examination of corpses and by fæces examination.

(7) Measures were taken to enforce the isolation of patients and their neighbours and of bacillus carriers.

(8) Measures were taken to enforce careful disinfection under the direction of a sanitary corps.

(9) Measures were taken to prohibit the landing of passengers and crews of ships from Japan until the authorities were satisfied of the result of a fæces examination conducted during the voyage.

(10) The departure of ships bound for Japan was authorized only after the passengers and crews had been isolated for twenty-four hours before departure and a strict examination had been made.

Owing to previous experience gained in the plague campaign of 1910 and carried out in co-operation with the Chinese local officials, the Japanese authorities proposed to the provincial Governor of Shantung on August 12, after establishing the temporary epidemic bureau at Mukden, to adopt co-operative measures against the spread of the epidemic. Under the agreement the Japanese authorities sent out three medical officers to Chinese territory to assist in the work and, in the Chinese territory of Mukden, thirteen wells were dug at the expense of the Manchurian Railway Company in order to provide the inhabitants with a good water supply.

As the Chinese authorities in Newchang had not sufficient medical officers, the Japanese authorities dispatched a medical officer to assist in their work, and by the united efforts of both authorities the epidemic was checked in a comparatively short time.

In April, 1920, the territorial authorities were informed of the existence of an epidemic in Amoy and Formosa, and they consequently instituted a quarantine for ships coming from these districts. At about the same time an outbreak of cholera occurred in Chungking, which gradually spread along the Yang-tse River, attacking Shanghai, and this was followed by a similar outbreak in Japan. As these conditions were a menace to Manchurian territory, the authorities issued an order on May 25 warning the inhabitants of the danger, and encouraged preventive vaccination. Steps were also immediately taken to enlist the assistance of fifty medical and 200 sanitary officers, who inoculated over 435,000 persons, this number being about half of the total population. As the result of these measures there were only nine cases of cholera, with two bacillus carriers in the leased territory, outside the territory the cases being limited to sixteen, with thirteen bacillus carriers.

No definite figures are available of the number of cases in Chinese territory, but there were certainly several thousand.

VI.

Importance of Epidemiological Intelligence in the Far East.

The origin of the epidemics which raged in Japan and her territories, as described above, is traceable in all cases to districts in Southern China. Especially from the point of view of the international prevention of epidemics, Shanghai has a unique position in regard to preventive measures owing to its central position in trade and commerce. Japan is so situated geographically that it is of paramount importance that she should have good epidemiological intelligence, especially as regards epidemics in Shanghai, where an outbreak of cholera occurs almost every year during the period

from June to October, whilst in every four or five years there is a recurrence of severe epidemics, which spread not only in China, but also to adjacent countries.

The cholera epidemics which formerly raged in Shanghai were introduced from the southern part of Asia or Southern China, but in recent years cholera has become endemic in this district.

In order to check the spread of cholera into Japan proper, Chosen, Formosa, or Kwantung Leased Territory, the Japanese authorities adopted measures which entailed heavy expenditure to enforce strict medical inspection at the ports, and endeavoured to discover cholera patients or bacillus carriers by the bacteriological examination of fæces; they also encouraged anti-cholera vaccination among the civil population.

Owing to its geographical position Kwantung Province suffers most from cholera imported from other parts of China. For this reason, when in 1920 a cholera epidemic was reported in South China, the authorities of the province, desiring to take precautionary measures against its importation before the publication of a quarantine notice by the municipality of Shanghai, already on June 16, 1920, instituted a quarantine inspection of all the boats coming into Dairen from Shanghai, and ordered a fæces examination of both passengers and crews. This method is considered to be the most simple and effective.

Against this measure, however, the British Chamber of Commerce of Shanghai in the beginning of June, 1920, passed a resolution protesting that the quarantine inspection enforced in Dairen was an obstacle to trade and commerce. The reason for this resolution was that no quarantine notice had been issued for cholera by the municipality of Shanghai. Again, on September 5, 1921, the Japanese Chamber of Commerce of Shanghai passed a resolution asking the authorities of Kwantung Province to cancel the fæces examination at Dairen because there had been no published official notice of cholera up to August 4 in the report of the municipality of Shanghai. On the other hand, the Japanese authorities contended that there were cholera cases in Shanghai, even though no official notice had been issued by the Shanghai authorities. Whether this contention was justified will be made clear in the remaining part of this report.

Shanghai is one of the great centres of Far Eastern commerce, and according to the investigations of the municipality of Shanghai in 1920, a population of 783,146 lives in the district known as the foreign concession. Of this number about 760,000 are Chinese and 23,000 are foreigners. In the absence of statistics it is difficult to know the exact number of the Chinese population outside the foreign concession, but it is estimated that there are about twice as many people outside. The sanitary condition of this district is very poor, and communicable diseases are invariably traced to this locality. It is said that the number of cases of infectious diseases amount to ten times the number found within the foreign concession. There is, however, no system of epidemic intelligence. The result is that the life of the people adjoining the territory is endangered, and the authorities of the neighbouring countries are forced to adopt drastic preventive measures against epidemics.

The number of deaths by infectious diseases occurring within the foreign concession are reported weekly by the municipality, but, in spite of repeated epidemic of cholera no case was reported officially outside the concession until 1920.

In June, 1919, owing to the receipt of information regarding an outbreak of cholera in South China, and especially in Shanghai, the authorities in the Kwantung Province, considering it urgent to take measures for quarantine port inspection at Newchang, requested the Chinese authorities to adopt such measures. The latter refused, and no quarantine measures were imposed at the port. Cholera soon found its way to Newchang, and spread to Southern Manchuria and Chosen.

Again in 1920, the first case of cholera reported by the municipality in Shanghai occurred on July 6, but on the day before (July 5) the *Kobe Maru* left Shanghai bound direct to Dairen. When this boat arrived at Dairen on July 7 a cholera case was found on board. On her return trip from Dairen to Shanghai the *Kobe Maru* touched at the port of Tsingtau, and another new case was found. There is thus reason to suppose that at Shanghai, before the report of the first case was issued, a cholera epidemic had already broken out. Furthermore, in 1921, in Shanghai, the first cholera case was officially reported on August 4, although at the beginning of July of the same year there were numerous deaths among the Chinese population of Shanghai which were caused by choleraic diarrhœa, called by the Chinese "Kakuran" (Cholera nostras). On July 21 a Japanese student living in Shanghai died of typical cholera.

These facts show beyond dispute that it is very difficult for the Japanese authorities to take effective measures against infectious diseases if they have to wait for a report issued by their neighbours. The Japanese authorities have therefore been doing their best to collect information on the epidemic situation in China and to adopt preventive measures accordingly. Since 1914 the Government have placed medical officers in important ports of the Far East, such as Shanghai, Hong-Kong, Manila.

Unfortunately, the public in general has not been well informed as to the situation. It has understood that the report issued by the municipality of Shanghai covered the whole city, including the Chinese district. There have been repeated protests against the measures adopted by the Japanese authorities, on the ground that they hindered trade and commerce, and tended to discriminate against foreigners. This has not only complicated the measures necessary to fight the epidemics, but has even complicated diplomatic relations between some nations. This regrettable

situation arises as a result of the lack of an effective system of epidemiological intelligence in the Far East, and more especially in China.

Conclusion.

In view of the situation of public hygiene in Japan and in her territories, which are constantly exposed to the danger of acute infectious diseases as I have described above, the Japanese authorities concerned, after a careful scientific investigation and as the result of a practical experience extended over many years, came to the conclusion that it was desirable to amend in certain respects the public health laws relating to infectous diseases. With this object the Diet passed a law in April, 1922, revising law No. 36, enacted in 1897 for the prevention of infectious diseases, and law No. 19, enacted in 1899 concerning port quarantine regulations. The following points may be mentioned as the most important:—

In the revised law for infectious diseases, epidemic cerebro-spinal meningitis and paratyphus were added to the eight infectious diseases already designated in the law, namely: cholera, dysentery (including ekiri), typhoid fever, small-pox, exanthematous typhus, scarlet fever, diphtheria and plague.

In cases of cholera or plague the provisions of the present law were to apply to suspected cases. Furthermore, virus carriers of an infectious disease were to be treated as actual cases of infected persons. In case it should not be found possible to apply the present law to virus carriers of an infectious disease other than cholera, a special provision could be provided by ordinance, this provision being also added to the port quarantine law. It also provided for the destruction of insects in addition to rats.

In the provisions of the Port Quarantine law which had been in force previous to the present revision, a case of infectious disease alone was designated, but in the revised form a case of death from an infectious disease, cases of contamination, or suspected of contamination are also added, thus making the regulation very strict as regards port quarantine measures.

It is specially to be noted that in the revised form of law the virus carrier is treated as an infected person. This is a most important provision in preventive measures against the spread of cholera, as the Japanese authorities have learnt by bitter experience in fighting against the invasion of infectious diseases. Among the sanitary authorities of other countries the danger of the virus carrier is well known, but no other country, except Japan, so far as I know, has enacted a law to control the virus carriers on the same basis as the infected person. It is therefore important to consider this point in the forthcoming International Sanitary Conference which is to revise the existing International Sanitary Convention.

For the effective control of infectious diseases it is essential to have international co-operation. This is especially true in the Orient, where the recurrence of infectious diseases is constant. In the Orient more than elsewhere the need of the effective exchange of epidemiological intelligence and international co-operative effort for the prevention of epidemics is urgent.

A CASE OF *ISOSPORA HOMINIS* (RIVOLTA), DOBELL, PROBABLY CONTRACTED IN DURBAN, SOUTH AFRICA.

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While the eastern part of the Mediterranean littoral may probably be looked upon as the region where cases of infection with *Isospora hominis* (Rivolta), Dobell, are most likely to occur, nevertheless it is important that cases occurring elsewhere should be noted with a view to establishing, as far as possible, the geographical distribution of the parasite.

Since the war five human infections with *Isospora* have been reported, and all of these, with one exception, which was diagnosed in the Philippines, Haughwout, 1921, occurred in Africa.

During the course of the campaign in East Africa one of us (H. B. N.) met with two cases of human coccidiosis. The first was a nursing sister who had been stationed in Portuguese East Africa for some months, and was convalescing after an attack of paratyphoid fever when the oöcysts of the *Isospora* were discovered in her stools. Previously she had been stationed in the Mediterranean area. The second case was that of a private soldier who had been drafted to Portuguese East Africa direct from England. About three months after his arrival he began to complain of attacks of diarrhœa recurring every ten days or so and lasting about two days. Examination of his stools showed a fair number of oöcysts of *I. hominis*.

It is fair, we think, to assume that both of these cases became infected in Portuguese East Africa, seeing that in all the cases systematically studied hitherto the duration of the infection in man has only been a short one, probably from five to eight weeks.

In the present case the patient, a lady, had lived in England for many years until proceeding to South Africa in April, 1920. She lived there for about two years in all. For the first fifteen months she was resident in Port Elizabeth, and then went on to Johannesburg, and later to Durban, where she remained for some months before sailing for England in June, 1922.

Her health during her stay in South Africa was good, except that she had a chronic skin condition

which first manifested itself on the journey out and recurred from time to time. On the voyage home she complained of attacks of "dysentery," which, from her description, would appear to be more correctly described as acute diarrhœa. These attacks recurred from time to time. When she arrived in this country she consulted a medical man for her chronic skin trouble, and, at the same time, mentioned the "dysenteric" attacks. In order to clear up, if possible, the cause of this bowel complaint a sample of her stool was submitted for examination.

The stool was a soft, semi-solid one, light brown in colour, and had rather a fermentative appearance. It was not unduly offensive. There were no signs of blood or mucus. Microscopically the stool showed, in addition to the öocysts, much vegetable debris, numerous Charcot-Leyden crystals, a few crystals which were long, narrow, pointed at each end, and distinct from the Charcot-Leyden crystals, and a very small number of epithelial cells. No pus cells or blood elements were observed. There were no *Entamœbæ* present, but a few *Chilomastix mesnili* were found.

When first seen on July 13 the cytoplasmic contents filled the majority of the oöcysts, but several showed the contents retracted towards the centre. Thereafter the stool was kept at laboratory temperature and examined daily. On July 16 some of the oöcysts showed the contents divided into two sporoblastic masses, but by far the greater number showed no change whatever. On July 23 one oöcyst was found containing two sporocysts with four sporozoites and a large mass of residual material in each. Only one other oöcyst was found which had undergone complete development, and that was on August 12.

It is interesting to note that the greater proportion of the oöcysts showed no development after the stool was passed, possibly as the result of non-fertilization, and also, with a few exceptions, that development proceeded only a certain length before it was arrested, after which the oöcyst degenerated and died.

The oöcysts were of the characteristic oval shape with blunt, rounded ends, and the central portion somewhat bulging. In length they varied from 26 microns to 34·5 microns, and in width at the broadest part from 12 microns to 16·5 microns. Considerable variations in shape were found.

The Charcot-Leyden crystals, whose presence in the stool was noted above, were large in size, and only found singly and not in clumps as is sometimes the case in stools from patients with dysentery due to *Entamœba histolytica*. In the stool submitted there were no *Entamœbæ* found, but that, of course, does not exclude the possibility of a chronic entamœbiasis. Unfortunately it was not possible to obtain further specimens nor to keep the patient under observation for a sufficiently long period to exclude a chronic entamœbic infection, since it is significant that in the cases of coccidiosis due to infection with *Isospora hominis* reported by Noc, 1920, Haughwout, 1921, and Connal and Young, 1922, Charcot-Leyden crystals were found.

We desire to express our thanks to Miss Marjorie J. Triffitt, B.Sc., Privy Council Research student, for her kind assistance in studying this parasite.

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ANTIMONY AND SULPHUR IN THE TREATMENT OF LEPERS.

By F. G. Cawston, M.D.Cantab.

In July, 1920, I reported the success I had obtained in the treatment of some leper patients with Messrs. Oppenheimer, Son and Co.'s colloidal preparation of antimony, and in August, 1921, suggested that a preliminary course of treatment with antimony might be combined with a few injections of colloidal arsenic and sulphur.

In November, 1921, Major Archibald reported success from the treatment of a case of tuberculous leprosy at Khartoum with colloidal antimony sulphide, which success was confirmed in the treatment of another leper with intravenous injections of stybenyl.

On February 17, 1922, I received a letter from Dr. V. M. Macfarlane, the Superintendent of the Botsabelo Leper Asylum in Basutoland, inquiring about the antimony treatment for leprosy, and asking if I had ever used a solution of tartarated antimony. In my reply I related my experience with tartar emetic in the treatment of bilharzia disease, and posted him a supply of colloidal antimony and sulphur for use in the treatment of some lepers.

The result of a series of small injections of tartar emetic (a total of but 8½ gr. in eleven injections spread over some weeks) were disappointing; but, judging from the temperature charts, there would appear to have been some distinct improvement from six intramuscular injections of the colloidal antimony and sulphur in two acute cases of leprosy.

In April, 1922, Dr. J. W. S. Macfie wrote from Accra, on the Gold Coast, to say: "We have hitherto treated only one case of leprosy with antimony. This was a native man. He has received altogether (between July 5, 1921, and February 21, 1922) 52 c.c. oscol stibium and 52 gr. sodium antimonyl tartrate from Dr. O'Brien, the latter drug being given latterly at my suggestion. I saw the patient in July on several occasions. In February I saw him again, and I certainly considered that he was much better—the skin lesions had practically disappeared, and in nasal secretion no *Bacillus leprœ* could be found, although six

months previously they had abounded. This case seemed encouraging." It is possible that the immediate effect of antimony in the treatment of leper patients is upon the fatty envelope of the bacillus, and that small doses of tartar emetic given only occasionally might tend to increase the number of free bacilli in the blood-stream or even precipitate an acute attack of leprosy. If this is so, we have further reason for contending that colloidal sulphur should be combined with antimony in the treatment of lepers and a possible explanation of the improvement of those cases which have been treated with Messrs. Oppenheimer's colloidal preparation of antimony, which contains, at my suggestion, sufficient sulphur to counteract any metallic poisoning that might arise from the administration of colloidal antimony alone.

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Experimental Transmission of Yellow Fever (P. Perez Grovas, M.D., *Journal of the American Medical Association*, vol. lxxvi, No. 6, 1921).—The author is of the opinion that yellow fever has been transmitted experimentally to the guinea-pig by injecting intraperitoneally the blood of patients taken during the third or fourth day of illness. Pure cultures of *Leptospira icteroides* have been obtained with the blood either from yellow fever patients or experimentally infected guinea-pigs by using the culture medium and technique described by Noguchi. The organism isolated in Vera Cruz has the same characteristics as that isolated by Noguchi in Guayaquil. The experimental disease has been transmitted in indefinite series by means of inoculation in a manner described in this paper. The passage of the leptospira through the guinea-pig enhanced its virulence for this animal, and the period of incubation and the duration of the disease has been markedly shortened by passages. The cultures of the organism are pathogenic for the guinea-pig, and the disease is reproduced by means of cultures with all its characteristics.

Up to the present time not a single guinea-pig has recovered, but that may be due to the fact that the cultures used were not old enough. The experimental disease induced in the guinea-pig is analogous in its symptoms and lesions with the natural disease in man. It is rare that an experimental disease is so similar to the natural disease. Subsequent experiments, in which positive transmission was obtained in three out of seven cases by using young guinea-pigs rendered susceptible by underfeeding just previous to the injection of blood and by injecting a large quantity of blood (from 2 to 3 c.c. in most instances) will be reported later. Fatigue also renders the guinea-pig more susceptible to infection.

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THE FAR-EASTERN ASSOCIATION OF TROPICAL MEDICINE CONGRESS IN SEPTEMBER, 1923, AT SINGAPORE.

THE next—the fifth—Congress of the Far-Eastern Association of Tropical Medicine is proposed to be held in September, 1923. The meeting is announced to open on September 3, and to continue

to the 17th of the month. Singapore has been selected as the place of assembly. The place and date of the meeting was selected at the 1921 Congress, when it assembled in Java at the town of Weltevreden. At that wonderful gathering in August, 1921, Dr. A. E. Horn brought forward a proposal from the Governments of the Straits Settlements and Federated Malay States that the next meeting should be held in their districts and under their auspices. No change has so far been made in the date of the meeting, so that we may assume that the date of the Congress is definitely settled. The following were elected as Officers of the fifth Congress:—

President: Dr. A. E. Horn.

Vice-Presidents: Dr. A. L. Hoops, Alor Star, Kedah, Malay Peninsula, via Penang; and Dr. Richard Dowden, Perak, Taiping, Federated Malay States.

Honorary Secretary: Dr. John William Scharff, Malacca, Straits Settlements.

The object of the Association is to promote the science and art of tropical medicine in the Far East. The original purpose has been well carried out. The previous meetings were most successful. The area comprehended under the ægis of the Association embraces the enormous islands of Java and Sumatra, the whole of the Eastern Archipelago, numbering over a thousand, and stretching over 1,000 miles from east to west, the whole of the Malay Peninsula, the island of Penang, the Kingdom of Siam, the Franco-Chinese Empire, Borneo, Hong-Kong, the Philippines, China, Korea, Japan, Formosa, &c., with a population approximating in numbers from one-third to half the peoples of the globe. The amount of clinical material is unfathomable, and the field for research and study unlimited: the scientist's Valhalla and the clinician's dream.

This beautiful island, Singapore, where the Congress is to be held, is a mere speck on the ocean, but the meeting-place of the sea traffic of the Far East; as Clapham Junction is to the traffic of London, so is Singapore to the commerce of the Far East.

The climate of Singapore, lying as it does within the Tropical Zone (being only one to two degrees north of the Equator), is in the belt of perpetual calm, where typhoons are unknown, where the seasonal changes are unnoticeable, where the temperature ranges from 70° to 90° Fahrenheit, where the nights are cool, and refreshing sleep possible. The atmosphere is serene and the ocean swell is slight, being only the wash of the distant storms or typhoons in the China Sea and the Bay of Bengal. The wind amounts merely to seabreezes, and the rainfall mere showers instead of periodical rains, which occurs at intervals throughout the year, that "refresh and cheer" the ground, so that the vegetation is continuous and the country green throughout the seasons. The fruits are plentiful and varied. Here we find pineapples grown in abundance, and now affording a large canning export industry, perhaps one of the largest in the world; others are custard apples, and plantains are in season all the year round. The mangosteen is practically confined to this district of the earth—the most glorious of fruits, being the "promise of heavenly gardens." The evil-smelling durian which taints the air of the Straits but yet becomes an article of diet to dwellers on shore, who become accustomed to its forbidding smell and find in it a store of nourishment; such fruits and vegetables unknown in Europe as blimbing, duku, langsat, loquat, lychees, persimons, mangoes, rambutan, tarrup, tampang and others are to hand; and a useful fodder for animals is obtained from the saltbush or *Rhagodia*. Most of the domestic animals of Europe are found, but the size of the main island being but 17 by 14 miles in extent does not allow of broad pasture lands. Around the main island lie some seventy rather tiny islets, all within a radius of ten miles of the centre.

Such is the setting in which this important gathering in September, 1923, is to take place.

The first week will be devoted to discussions in Singapore itself, but the second week will be given over to travel throughout the important centres in the peninsula. The scientific seat of research at Kuala Lumpur, over which Dr. Stanton has so long presided, will be an open door to visitors, who it is hoped will discourse on the various important subjects being dealt with. The plantations and the management and housing of coolies on rubber lands, ever a serious problem, can be studied at first hand.

The Governments of the Straits Settlements and Malay States have promised loyal support and given liberally towards the expenses involved. All medical members of the Association and those within the extensive area it covers—military, naval and civil—are invited, and as one of the principal objects of the Congress is to direct public opinion in regard to hygiene, it is meet that not only the heads of firms be invited to the Congress, but that the more intelligent of the native workmen should be invited as well to be present.

This is an excellent opportunity for medical men and sanitarians in Britain to visit the tropics. Singapore is the nearest large centre of the Far-Eastern Association to London, and it should prove an attraction to men in the homeland to meet their Eastern confrères. It is to be hoped that arrangements should be made with one of the many Eastern lines of ships and give the details prominence throughout Britain. The voyage takes practically three weeks to reach Singapore, and the journey back may either be by Hong-Kong, Japan and America, or by returning by the same route give a fortnight in Singapore—practically the holiday months August and September.

In the area embraced by the Association there are some 600 men practising and working who hold British diplomas. All cannot leave their practices, but there are many able men both in the medical and hygienic circles whose names are well known

as original observers, as pathologists, as clinicians, as discoverers, and teachers in universities, colleges and laboratories whose work is interesting and whose names are world-wide.

One of the outstanding institutions in Singapore is the Raffles Museum. Founded in 1823, it has become a storehouse of immense value and well worth the long journey to see.

Within the last twenty years the medical men in the Far East have multiplied enormously. In Shanghai, Hong-Kong and Singapore they have increased about five-fold.

It must never be forgotten also that within the area covered by the Association tropical medicine harboured the "Father of Tropical Medicine," for in Formosa, Foochow and Hong-Kong Sir Patrick Manson worked and dwelt, and the idea of the conveyance of disease by insects was conceived and proved.

J. C.

Annotations.

Galactagogue Action of Carbohydrates (R. Eyzaguirre, *Anales de la Facultad de Medicina de Lima*, December, 1920).—The author has been impressed by the increase in the flow of breast milk when carbohydrates are freely eaten. A dish called *chufla* is particularly useful in this way; it is composed of boiled rice, sweetened and flavoured with chocolate, a household galactagogue that has been adopted by household physicians as they noted the efficacy. The diet should be mainly farinaceous, although galega seems to be the most effectual galactagogue aside from the sucking of the child.

Diabetes and Trauma (S. Diez, *Policlinico*, March, 1921).—The author quotes statistics which show trauma as a factor in 2 per cent. of 4,068 cases of diabetes. The trauma affected the skull, spine or abdomen, or was peripheral. In many of the cases there was a traumatic neurosis as well. The author discusses the causal connection from various standpoints, and the aggravating influence of diabetes on the recovery from an accident, and also the influence of a trauma on the development of gangrene in diabetes. Diabetics should be warned against occupations exposing them to accidents.

Keeping Fit in the Tropics (Captain Elbridge Colby, *The Military Surgeon*, vol. xlviii, No. 2, February, 1921).—The author summarizes his article in the following manner: The proper rule of life in the tropics is to eat in moderation; sleep a proper amount—neither too much nor too little—and at the proper time; avoid "drinks," and get plenty of outdoor exercise.

As regards the eating question, most tropical settlers agree upon the theory against overeating, and especially against the excessive use of meat. The sleeping question is the same as in any other part of the world; daytime siestas are not recommended, as these tend to make one lazy and generally unhealthy. As regards drink, alcohol is as bad in Panama as it is in Paris, and its effects are far worse in quality. Cooling drinks are universally acknowledged to be bad for an overheated person, which persons in the tropics frequently are, as they induce excessive perspiration and call for repetition.

Exercise should be taken in the sunshine every day—games, swimming, riding, &c., and loose clothing should be worn on every possible occasion.

Blood Volume in Pernicious Anæmia (G. P. Denny, M.D., *Archives of Internal Medicine*, vol. xxvii, No. 1, January 15, 1921).—A description is given of a method for calculation of blood volume, by which nineteen determinations were made in ten cases of pernicious anæmia, the total blood volume being reduced in all but two cases. Plasma volume remains essentially normal, but the total volume decreases owing to the loss of cell mass. There is no noticeable relation between the severity of the disease and the decrease in total volume.

Rectal Injection of Massive Doses of Neoarsphenamin (Henry G. Mehrtens, M.D., *Journal of the American Medical Association*, vol. lxxvi, No. 9, February 26, 1921).—The author comes to the conclusion that neoarsphenamin can be safely given intrarectally in doses as large as 4 grm. Arsenic is absorbed into the blood after such injections, and larger quantities are eliminated in the urine than after ordinary intravenous injections of arsphenamin. Arsenic persists longer in the blood in perceptible quantities after the rectal method with large doses than after ordinary intravenous methods. About equal concentrations in the spinal fluid are obtained with either method.

It is believed, that all things being equal, the intravenous method of administering arsphenamin and neoarsphenamin is still the method of choice in most cases. But, based on the above conclusions, it is felt that the rectal administration of neoarsphenamin has a place in therapy when massive doses are used, especially in the cases of children, those with difficult or impossible veins, and in the cases of those to whom, for any reason, intravenous injections are dangerous or undesirable.

Sodium Citrate Treatment of Thrombo-angiitis Obliterans (William A. Steel, M.D., *Journal of the American Medical Association*, February, 1921).—The author has employed the sodium citrate method for the last three years with encouraging

results, using the following technique: During the first month the patient is kept in bed with the legs constantly under a hot air electric light bath at 110° F.; 250 c.c. of 2 per cent. sodium citrate solution is given intravenously every second day. The second month the interval of injection is lengthened to every third or fourth day; daily leg massage is given, and the patient is put in a wheeled chair with the feet hanging down a short time each day; or, if the case is not advanced, some walking is allowed. The intervals of injection gradually lengthen until at the end of a year the patient gets one every two weeks. Increased walking is permitted as the symptoms subside and evidence of a functional collateral circulation appear. Potassium iodide, 10 drops three times daily, is given during the whole course of the treatment. The iodide is always well borne. The length of the treatment is regulated by the results obtained in establishing a functional collateral circulation.

The effects of this plan of treatment have been: relief from pain after the second injection; the checking of the gangrene and spontaneous amputation of the dead tissue; healing of indolent, painful ulcers, and a slow but sure establishment of a collateral circulation, as shown by improved colour, warmth of the foot, the swelling of the subcutaneous veins, and a strengthening of any existing pulse. In two cases there occurred a re-establishment of an anterior and a posterior tibial pulse.

Epinephrin in Resuscitation from Apparent Death (C. Walker, M.D., *British Medical Journal*, No. 3,132, January, 1921).—In twenty cases of death from various causes, when all signs of life had ceased for some minutes, the author injected 1 or 2 minims of a 1:1,000 epinephrin chloride solution directly into the heart muscle. A fine needle was passed through the fifth left intercostal space, just mesial to the lung resonance; the point was directed slightly inward and upward, and could be felt to enter the apex of the heart; when firmly embedded in the muscle the injection was made. Several of these needle tracks were examined post mortem, and in no cases did it appear that any drawback would have occurred if the patient had survived.

Ophthalmia associated with a Dietary Deficiency in Fat Soluble Vitamine A (Isabel M. Wason, M.D., *Journal of the American Medical Association*, vol. lxxvi, No. 14, April, 1921).—The author comes to the conclusion that the primary ætiologic factor in the ophthalmia of rats on deficient diet is the lack of fat soluble vitamine A. The nature and mechanism of the change in these rats whereby their corneas are rendered susceptible to bacterial invasion is unknown. The type and virulence of the organisms of secondary infection determine, in part at least, the course of the disease.

The anatomic manifestations of the disease are characterized by hyalinization or necrosis of the outer layer of corneal epithelium, exudation of serum and cells into epithelium and stroma, and a proliferation of blood-vessels and fibroblasts. In advanced cases invasion of the anterior, and occasionally of the posterior chamber, results. The degree to which restoration is possible depends on the extent of the secondary injury.

Immunological Distinctions of Two Strains of the Mouse Typhoid Group isolated during Two Spontaneous Outbreaks among the same Stock (Harold Amoss and Peter Haselbauer, *Journal of Experimental Medicine*, vol. xxxvi, No. 1, July, 1922).—Two strains of the paratyphoid B enteritidis group causing separate epidemics of mouse typhoid among 2,500 to 4,000 cancer-breeding mice are found to be antigenically different. Mouse Typhoid I, isolated from the first outbreak, is related but not identical with two strains of enteritidis, while Mouse Typhoid II is related to but not identical with the human paratyphoid B strains.

On Rope (and Sourness) in Bread (D. Jordan Lloyd, A. B. Clark and E. D. McCrea, *Journal of Hygiene*, vol. xix, No. 4, March, 1921).—The authors come to the conclusion that the skins of grains, all flours and all bread contain bacteria belonging to the group *Bacillus mesentericus*. The cultural characters of six types of *B. mesentericus* isolated from grains and flours are given. Five of these types can be identified as corresponding to the organism isolated by earlier workers on rope. Rope, or sourness, does not result from the presence of these bacteria unless conditions are such as to allow of great development. The factors determining development of rope in bread are: (1) Degree of infection; (2) moisture; (3) temperature; (4) reaction; (5) composition of the flour.

Röntgentherapy in Malignant Diseases (George E. Pfahler, M.D., Philadelphia, Pa., *New York State Journal of Medicine*, vol. xxii, No. 7, July, 1922).—This is not the only method of treating malignant disease. It is one method in which definite results have been accomplished to advantage with surgery, radium and electro-coagulation. Malignant disease attacks all classes, producing enormous death-rate, comes on insidiously, spreading and loathsome; the individual case concerns the surgeon. It is impossible to lay down rules or draw accurate conclusions. Study has been done on the effect of radiation on malignancy by Colwell and Russ. The changes taking place in the tissues have been given by Clunet and Raulot-Lapointe. The result of observation on nienteen cases of cell carcinoma of Malpighian type in the human subject

before the ultimate disappearance of the growth cells pass through five successive phases:—

(1) *The latent phase* is from six to fifteen days; no cytological changes to be seen. It is shorter for carcinoma of spino-cellular type than the baso-cellular.

(2) *Development of monstrous characters.*—Marked by enlargement of all parts of the cells in increased diameter. An increased number of atypical mitosis. The appearance of enlarged nuclei markedly chromophile. The appearance within cell forms has a pseudo-parasitic character.

(3) *Keratinization* may be total or atypical. Disseminated cells undergo keratinization, independent of its neighbour; protoplasm becomes granular at first, orangeophile, and finally eosinophile. The muscles become clear and keratin follows. Nuclear keratinization may occur without the pycnotic stage.

(4) *Disintegration and Phagocytosis.*—Disintegration of cells appears caused by polynuclear fibroblasts of stroma in active condition. The masses of degenerated cells, before being entirely destroyed, cease, and give a colour reaction of keratin.

(5) *Formation of Connective Tissue Scar.*—This is not brought about by the formation of fibrous masses. Tissues assume a healthy skin, except for absence of hair and glands. *Epithelioma of skin* divided into the baso-cell. In a review of 644 cases basal-cell epithelioma, which were treated in the years 1910 and 1919 by Mackee, with a cure of 91 per cent., Mackee remarks the cases were not selected; one half of failures due to patients' inability to have a second or third treatment. 91 per cent. seems very satisfactory. If the basal-cell epithelioma are treated before they have invaded the cartilage, bone or fascia, that all of them would be well. Mackee states he destroys these epitheliomata by electro-coagulation, followed by radiation, excepting cases involving the eye. Radium gives the best results. Destruction of bone lesions by electro-coagulation is apt to follow necrosis.

Conclusion.—Radiation has made large strides in treatment of malignant disease. Great progress made in latter years. Treatment by radiation. Disease of skin and lip to be treated by radiation with electro-coagulation. Röntgen-rays, combined with radium and electro-coagulation; surgery best results. Röntgen-ray machines and accumulation of radium, the greatest caution and study is required in the application of these powerful agents.

A Case of Sprue in South Wales (J. Albert Goldsmid, M.B., *The Medical Journal of Australia*, June 10, 1922).—The patient to whom the notes refer was shown at the meeting of the North-Eastern Medical Association. All present concurred in the diagnosis of sprue. Miss A. B., aged 25 years, parents alive and healthy; the mother subject to gastric disturbance. The patient assisted in the dairy and house work

Past Illness.—She suffered from anæmia until 14 years of age.

Present Illness.—Three years ago she complained of persistent sore tongue and tenderness in epigastrium and pain soon after food. She was treated for gastric ulcer. Had there been any looseness of bowels, Albert Goldsmid would have suspected sprue. She was kept for seven weeks and the tongue improved. She did not quite get rid of the soreness. Six months later the tongue again became worse and she had diarrhœa. She had not been again since the attendance three years ago. She had been at Gympie, Queenland, in 1916 for five weeks, and again in Queensland. During the stay at Barcaldine the diarrhœa improved, and she gained 12·7 kg.

Present Condition.—She was a well-developed woman, weighing 81·2 kg. Temperature: pulse respirations normal. Tongue denuded in patches along sides and tip, areas are red, tender, causing great pain by eating. Similar patches along cheek pouches and inside lower lip. Fauces, reddened in posterior part of soft palate. Burning pain beneath sternum, and diarrhœa occurs in forenoon, profusely frothy, grey colour, evil-smelling, no pain in defæcation, no tenesmus, no staining. Before the stool some fullness and soreness. The burning pain beneath sternum occurs after food, and epigastric pain too.

Note on April 24, 1922.—Since March 7, 1922, she lost 4·5 kg.; difficulty to take enough milk when on an exclusively milk diet. Diarrhœa has disappeared, but the tongue condition is far from cured.

Treatment.—Exclusive milk diet. At intervals santonin, 0·18 grm. 1 dr. of castor oil for six successive days, also a bismuth mixture. Is taking potassium chlorate (in tablets). Washing mouth four or five times a day. Has been allowed bananas.

The Wassermann Reaction as an Index of Cure (C. H. Sherman, M.B., *The Medical Journal of Australia*, June 17, 1922).—The problem of syphilis is to determine when the patient may be regarded cured, namely, the disappearance of signs and symptoms. Of recent years increasing prominence has been given to a third factor, namely, the use of laboratory tests. As an indication of cure, observation of physical signs in syphilis offers little help. For a short indefinite time after inoculation the organ remains localized—shut off by a wall of inflammatory tissue—the outward sign being the chancre, the protective wall is broken through, and generalization occurs. Spirochætes become disseminated throughout the body in the blood and lymph streams, the thin walls enter adjacent tissues, a reactionary process is set up which result produces antibodies inimical to the invading organism. The spirochætes depend on two factors. First, the strength and rapidity of mobilization of the defen-

sive forces of the body, and, secondly, the blood supply to the part as, for example, the persistent headache, vertigo, &c., infecting the meninges. In other parts invasion in the walls of blood-vessels and in the central nervous system. In the latter situation conditions favour the survival of the organism owing to the relative non-vascular nature of the tissue and that antibody in the intrathecal system. The local reaction gains defence by walling a zone of inflammatory tissue and further from the blood supply. Most patients seek advice only when generalization of disease has occurred. Such unsuspected but persistent foci is of importance regarding the third factor, i.e., the laboratory test, which is a source in determining the cure. Probably no other laboratory test has met so much criticism as the complement-deviation test applied by Wassermann to the diagnosis of syphilis. It is universally agreed, so long as general principles affecting technique are adhered to, the test holds a position of unassailable value. In the absence of other criteria in this respect there is danger of conceding to a test significance out of all keeping. The modern treatment appears to resolve itself into "a frenzied effort to obtain a negative Wassermann" and to cease treatment and to regard the patient as cured, which is absurd. The most workable theory and one generally accepted to explain positive response with a syphilitic serum is that of a substance known as "Wassermann substance." A positive Wassermann would (*a*) denote living spirochætes, and (*b*) cell reaction. Accepting this hypothesis, we expect a negative result with serum of syphilitic persons under conditions; (1) In the early stage of infection before the body mobilizes to meet the invading organism. This explains negative result met in early primary stage. Organisms overwhelming in action, the body unable to defend as in malignant syphilis. If defensive elements of the body gain ascendancy it renders the spirochæte temporarily hors de combat.

Stomatitis and Glossitis in Association with False Teeth (Mary C. de Garis, M.D., B.S.Melb., Melbourne, *Medical Journal of Australia*, June 17, 1922).—Stomatitis and glossitis have not yet been sufficiently recognized. Miss de Garis states that she has diagnosed it herself. In her view the false teeth become infected and act as a foreign body; treatment has been successful. Her patients varied in signs and symptoms. Some complain of great dryness of mouth at night, others of sores at the angles of mouth; another, stomatitis with ulceration of tongue; others, of milky patches on tongue, with recurrence of superficial glossitis, so severe as to make it impossible to take solid food sufficiently; then gastric symptoms supervened. Had a sore tongue for two years. Preventive treatment to be applied to those with mumps and false teeth. The patients treated most were liable to recurrences. Patients quickly relieved; the teeth to be cleansed and soaked in mild antiseptic; the mouth thoroughly washed with a mild antiseptic. In severe cases the teeth were left out the greater part of the day. Mouth-washes at frequent intervals. Listerine diluted did well for the mouth, and Listerine for the teeth.

Studies on Experimental Rickets.—XXII. Conditions which must be fulfilled in preparing Animals for Testing the Anti-rachitic Effect of Individual Foodstuffs (E. V. McCollum, Nina Simmonds, P. G. Shipley and E. A. Park, *Bulletin of the Johns Hopkins Hospital*, Baltimore, vol. xxxiii, No. 378, August, 1922).—The authors discuss the dietary conditions which must be fulfilled in conducting the "line test" for the calcium-depositing substance (anti-rachitic effect) of foodstuffs.

They discuss and emphasize the importance of selecting the highest quality of food grains; of using a rational system of protein purification; the use of salts of proven quality, and of taking into account the content of fat-soluble A in alcoholic extracts of wheat germ or other substance which may be employed as sources of water-soluble B.

Specific examples from experimental data are given to illustrate the pronounced anatomic changes which are brought about by relatively small variations in the composition of the diet with respect to those factors which play a rôle in bone growth.

The lactate of calcium proved a less satisfactory source of this element for promoting growth of the bones than did the carbonate, but the cause of this difference must await further investigation.

The Elimination of Arsenic in the Urine of Syphilitic Patients after Intravenous Injection of Arsphenamin (Charles Weiss, Ph.D., and George W. Raiziss, Ph.D., *Archives of Internal Medicine*, Philadelphia, vol. xxx, No. 1, July 15, 1922).—The authors summarize their article as follows:—

The elimination of arsenic in the urine was studied in three cases of tertiary syphilis which were under arsphenamin treatment and under observation in a hospital ward. Very small quantities of arsenic, detectable only by very delicate methods of analysis, were found in the daily urine. Thus, after a dose of 0·6 grm., containing from 187 to 188·6 grm. arsenic, from 3 to 8·8 per cent. was eliminated in three days, and from 4·9 to 13·5 per cent. in the course of a fortnight. By far the greatest amount of arsenic eliminated by the kidneys is, therefore, found in the urine of the first three days after injection. During the succeeding days the amounts gradually decline, until by the fourteenth day they usually fall to a level of from 0·1 to 0·5 mg., which approaches the limit of accuracy of the method used.

The following observations deserve special comment:—

(1) Only a small part of the arsenic derived from

arsphenamin is eliminated by patients through the urine, 13·5 per cent. being the highest amount in fourteen days.

(2) The largest amount of arsenic is eliminated in the first three days; after that uniformly small amounts are found in the urine.

(3) The elimination of arsenic is larger after the second and third doses are administered than after the first.

(4) Using constant doses of 0·6 grm. arsphenamin, there is considerable variation in the amounts of arsenic eliminated during a given interval of time by any one patient as well as by different patients presumably in the same stage of the disease and treated under the same conditions.

(5) The elimination of only small quantities of arsenic in the urine may be explained by the fact that a considerable quantity is eliminated through the fæces, and some is temporarily retained by the liver, kidneys, spleen, intestines and other parts of the body.

A review of the literature on arsenic elimination and storage and of the fate of the arsphenamin molecule in the animal body is given.

Surface Tension of Serum.—III. Recovery after Lowering by Surface-active Substances (Du Nouy and P. Lecomte, *The Journal of Experimental Medicine*, vol. xxxvi, No. 1, July 1, 1922).—The authors come to the following conclusions:—

(1) The equilibrium of the serum corresponding to its normal minimal surface tension is as stable and difficult to break, under ordinary conditions, as the osmotic tension equilibrium. The addition of a strong surface-active substance (sodium oleate, lyeocholate, or taurocholate) will not lower it definitely, unless the substance is present in largo amounts and in solution. After the first rapid drop has occurred a process of recovery takes place, which brings back the normal surface tension in a short time (from two to six minutes in the case of pure serum). As a drop in the surface tension of the serum of animals may be very injurious to the red cells, this process of recovery is a normal one of defence in all cases in which surface-active substances (bile) are set free in the blood.

(2) When diluted, the serum shows the same phenomenon to a smaller extent; the time of recovery is very much longer, and the final surface tension is always lower than the original value. At a dilution of 1/10,000 no recovery takes place, the dilution being too high to overcome the lowering action of 1/10,000 of sodium oleate.

(3) The recovery is stronger when the surface-active substance is added powdered or in a highly concentrated solution, and not stirred.

(4) The recovery does not seem to be inversely proportional to the concentration of sodium oleate, when added superficially. Doubling the concentration at 1/2,000, for example, gives the same curve of recovery. This happens under certain conditions, namely, when the liquid is not stirred after the addition of sodium oleate.

(5) This recovery is due to a purely physical phenomenon, namely, absorption, and is not specific for the serum. Other colloidal solutions, such as gum arabic, egg albumen, gelatin and silver and gold sols, show it, only to a smaller degree. The process of recovery follows a logarithmic law in all cases, expressed by an equation of the form $\gamma\, a = e^{bx}$.

(6) Temperature affects this phenomenon. At first it enhances it, but finally decreases it. This would seem to connect the loss of the property of the serum known as complement in a serum with a modification of the physical properties of this serum. This phenomenon is being investigated further.

A Comparison of Capillary and Venous Blood in Pernicious Anæmia (W. W. Duke, M.D., and D. D. Stofer, M.D., Kansas City, Mo., *Archives of Internal Medicine*, vol. xxx, No. 1, July 15, 1922).—The authors come to the following conclusions:—

(1) Capillary red blood cell counts on patients with pernicious anæmia were on an average 17·6 per cent. higher than similar counts made on venous bloods at the same time. The difference was as great as 37·4 per cent. in one case, and in every case it was 11·6 per cent. or more.

(2) Venous counts made after constriction of the arm with a tourniquet, combined with exercise of the hand, were materially higher than counts made before constriction of the arm and when the hand was at rest.

(3) An increased number of macrocytes was observed in capillary blood as compared with venous blood.

(4) The striking difference between the capillary and venous counts is caused, we believe, by a tendency for the larger red blood cells (macrocytes) to lag in the narrow capillary bed, where the rate of flow of blood is slow and the pulse is lost.

(5) It is believed that this accounts, in part, for the circumstance that a patient with pernicious anæmia may have relatively good colour of skin and lips, even though he may be gravely anæmic. This is misleading and frequently obscures the real gravity of the situation.

Original Communications.

THE HISTOPATHOLOGY AND HÆMATOLOGY OF GUINEA-PIGS INFECTED WITH *LEPTOSPIRA ICTEROIDES*.

By Professor W. H. Hoffmann, M D.

(*From the Research Laboratory, Health Department, Republic of Cuba.*)

In April, 1920, the Research Laboratory at Habana received from Noguchi a strain of *Leptospira icteroides*, which he had isolated from a case of human yellow fever in Mérida. The cultures, called Mérida, were inoculated here by Dr. Lebredo to guinea-pigs, which were infected in the typical way, and the disease was transmitted from animal to animal, the infected guinea-pigs always showing the leptospira in great numbers in their organs.

Dr. Lebredo has given an exhaustive study of the clinical and the pathological anatomy of the guinea-pigs infected with that leptospira [1]. I have personal experience of clinical observations and post-mortem examinations in about 200 cases. But I do not think it necessary to give here a detailed description, because I could only repeat what has been described so perfectly in the paper just mentioned. It is scarcely possible to add anything, because the cases are stereotypically one like the other with very slight variations. Only to facilitate the understanding of this paper I will try to give in a few lines the principal features of the clinical symptoms and the anatomopathological changes as seen by us in the guinea-pigs.

After an incubation period of some hours to several days the first symptom is a fever of 40° C. and more, which for three to four days remains high. During that time there will appear other symptoms, loss of activity, appetite and weight, pains in the muscles, finally a very marked jaundice and hæmorrhagic suffusions. The urine contains albumin and bilious pigment. About the fourth day generally the temperature drops suddenly down to less than 35°, and almost invariably the animals die in collapse. The strain is so virulent that only exceptionally it happened that an animal was cured, and only in bigger animals, which naturally are more resistant.

The post-mortem examination reveals especially a marked jaundice and diffuse hæmorrhagic spots in the subcutaneous tissue, the latter most marked around the inguinal and axillary glands. The lungs present a very typical aspect, with a great number of dark red spots on their whitish surface and on sections through the tissue; the spots are corresponding to hæmorrhages. The liver generally appears dark red and congested, but never shows the yellow colour and fatty degeneration as in human yellow fever. The spleen is a little enlarged and congested. The kidneys are swollen, of greyish colour and cloudy appearance, as if boiled, congested and icteric; often with small hæmorrhages on surface and sections. Suprarenals congested, enlarged, often of a grey-yellowish colour, and of a very dull appearance on sections. The stomach shows very typical hæmorrhages of the mucosa along the bigger curvature, but no blood in the contents. The intestines often present some fresh hæmorrhages on the peritoneal surface. Hæmorrhagic infiltration of the testicles is a very typical lesion.

In the following I shall give a report on the micropathological changes produced by the experimental infection of the guinea-pigs as I have been able to study them here. I saw the animals since August, 1920, the strain being in the twentieth passage. In about forty animals of the twentieth to fiftieth passage I made a minute study of the histopathological changes of all the organs. Of course I only selected typically infected animals showing leptospira in their blood and organs. As a rule, only quite fresh organs of animals immediately after death were taken for histological purposes, and generally fixed in formalin. The sections were stained with hæmatoxylin and eosin. The single cases showed all the lesions in such a typical manner with only insignificant changes in the degree that I do not reproduce the single protocols, but only give a summary of the results.

Liver.

The histological examination of the liver shows at once that the general structure of the liver is not essentially altered. With lower power we see immediately the whole structure of the liver tissue, similar to a normal organ, quite contrary to the human yellow fever, where the necrotic destruction of the parenchymatous cells is so enormous and complete that it is difficult to recognize the organ as liver, and where only very few and degenerated liver cells without a nucleus may be found, the rest being completely destroyed. In the experimental infection with *Leptospira icteroides* Mérida the structure of the acini is absolutely well preserved, and the histological picture is homogeneous throughout the section in all its parts. There are no zonal or focal alterations which were more pronounced in one part than in the other. What is observed at first sight is that generally there is some slight lymphocytic and polynuclear infiltration following the interacinous vessels.

Examining the liver cells, it is found that in all parts the nuclei of the cells are quite distinctly stained by hæmatoxylin, sometimes slightly swollen and sometimes less compact. The single cells are generally but little swollen, rounded and dissociated from each other. It seems that sometimes the protoplasm of the cells takes the eosin stain but little more than the quite normal liver cells do, and in such cells the staining of the nucleus may be a little paler, but always it remains quite distinct in all its details. Also there may occur cells in which the staining of the nucleus is little darker than normally.

Seldom are there found vacuolæ in the protoplasm, and if so, there are not more than one or two quite small ones, which do not essentially influence the character of the cell

Never have I found zonal degenerations in the lobules, as they are often seen in many infections and in acute intoxications, and as it was so well described by Rocha-Lima in cases of human yellow fever, for which the necrosis in the intermediate zone of the lobule between the central vein and the efferent veins is very typical and of diagnostic value.

In fresh preparations it is often seen that the cells, which are swollen, have a turbid and cloudy appearance, often containing a number of small refringent round dots, which mostly disappear on adding acetic acid. But there is no severe fatty degeneration, and also by Sudan staining it was confirmed that fatty changes in the liver cells appear only to a very slight degree, very often being completely absent, and never reaching an advanced degree of any importance. Most of the cells are free from fat.

It is evident and doubtless that the state which I found invariably in the liver of all the cases corresponds to the so-called cloudy swelling. No case has presented any symptoms of a marked fatty degeneration or of the slightest degree of necrosis.

Often there is some congestion of the blood-vessels, and slight hæmorrhages between the swollen liver cells are not uncommon. In many cases the capillaries are compressed by the cells, so that they are not visible. Also the bile capillaries seem to be compressed by the swollen cells, so that it is difficult to discover any bilious pigment in the sections.

It should be mentioned that in the transverse sections through the congested blood-vessels the number of white cells with relation to the red ones appears to be much higher than in normal organs.

In the gall-bladder I have often seen that the epithelium is desquamated, filling the lumen of the bladder.

Kidney.

In fresh preparations, made of the kidney, many of the epithelial cells of the tubuli contorti and recti appear very much enlarged and granular, and in many cases the protoplasm looks more homogeneous than normal, and the nucleus is not visible; many cells are in complete disintegration

With Sudan staining in the cells will appear a number of smaller or bigger fat droplets, often completely covering the nucleus. The fatty degeneration was also shown by osmium preparations.

In fixed preparations stained by hæmatoxylin and eosin in the greater part of the convoluted portions the epithelia appear irregularly swollen, cloudy and often intensely stained by eosin. In many cases the nucleus is swollen, and often fragmented or quite dissolved, and disappeared in consequence of necrosis. Many of the cells show vacuolization corresponding evidently to small droplets of fat which have been extracted by the alcohol treatment of the tissues.

In many places the necrotic epithelia are desquamated. The lumen of the tubuli is many times obliterated by the swollen epithelia or by desquamated epithelial necrotic masses, albuminoid substances, casts or blood. In the glomeruli the capillaries are generally full of blood; often the capsular space is filled with red cells corresponding to hæmorrhages from the capillaries. Also in Henle's tubules the changes are often similar to those in the convoluted tubules, especially in the form of cloudy swelling of the epithelia, and there are found granulated casts, sometimes in great number.

There appear numerous small hæmorrhages in the stroma of the kidney between the tubules, and on some places a slight infiltration with round cells, mostly plasma cells. Also in the collecting tubules the epithelia show similar degeneration as in the convoluted tubules, and are often desquamated. The tubuli likewise often contain blood, and also epithelial, hyaline and blood casts.

Also in the capsule of the kidney, especially near the inferior pole and in the space between kidney and suprarenals, the fatty and connective tissue is generally filled with extensive hæmorrhages. There are also hæmorrhages under the mucosa of the pelvis of the kidney.

Those lesions would correspond to a severe acute hæmorrhagic parenchymatous nephritis.

Suprarenals.

The adrenal bodies generally present a marked affection of the parenchymatous cells, which in many cases show severe fatty degeneration and even complete necrosis. The fatty degeneration is especially well seen in fresh preparations and in Sudan preparations, which show the cells rounded, dissociated, swollen and completely filled with drops of fat of different size. In fixed preparations there appear numerous smaller or bigger vacuolæ corresponding to the fat droplets. In stained preparations the protoplasm of the cells takes the eosin stain very intensely, whereas the nucleus is stained very faintly blue by hæmatoxylin, generally being swollen and vacuolated. In a great many cells there is nothing to be seen of the nucleus at all, and even great collections of cells can be found coagulated to a homogeneous necrotic mass. Sometimes the nuclei of the cells may appear compact, stained intensely by the hæmatoxylin of a dark-blue colour.

The pathological changes of the cells may vary in the single cases, but the marked fatty degeneration is scarcely ever missing.

Sometimes the cells of the medullary substance seem to be a little more affected, but also the cells of the cortex, especially in the zona fasciculata, may show the highest degrees of necrosis; so that the general structure is only maintained by single columns of cells, which are better preserved, or only

marked by hæmorrhages and slight round cell infiltration between the columns of cells.

Everywhere there are hæmorrhages between the cells, which are a very characteristic feature of the affection of the suprarenals in this experimental disease, and which are generally most pronounced in the medullary substance, irradiating from there into the cortical tissue.

Also there are many hæmorrhages near the capsule, the blood-vessels being full of blood and dilated.

Sometimes there is in the cortical substance a slight infiltration with small round cells, which appear as stripes between the cellular columns of the cortex.

In some cases I have found a good number of mitotic figures, which seem to indicate active regeneration of the organ cells following previous toxic necrosis.

Bladder.

In the urinary bladder there are generally found congestion of the blood-vessels and hæmorrhages—sometimes extensive—in the submucosa and between the muscular fibres.

Testicles.

In the testicles there are very marked hæmorrhages, especially in the connective tissue, which forms the septa between the tubules, and which appears by this process to be considerably enlarged. There are also hæmorrhages under the tunica albuginea. The epithelia of the tubules do not appear affected.

The hæmorrhages are often still much more marked in the epididymis and the connective tissue round it.

There are no symptoms of inflammatory reaction.

Female Sexual Organs.

The female genital organs show congestion of the blood-vessels and numerous small capillary hæmorrhages in the tissues of uterus, oviduct and ovary. I have not had the chance to make observations in pregnant animals; but it seems to me that the organs are so severely affected that the conditions for an abortion would be present from the infection.

Stomach.

The stomach, in the parts which show microscopically a hæmorrhagic character, shows numerous and extensive hæmorrhages between the glands of the mucosa and in the submucosa. There is a marked congestion of the blood-vessels. The glandular tubes are often separated from each other by extensive hæmorrhages. The epithelial cells are generally well preserved; only some superficial epithelial cells may show a slight necrosis. There may be some round-cell infiltration.

In many cases there are extensive hæmorrhages between the muscular fibres of the muscularis, which may be accompanied by round-cell infiltration. The muscular fibres appear sometimes swollen, and the staining of the nuclei of the muscular fibres is often very indistinct.

In the œsophagus I saw occasionally small hæmorrhages between the muscular fibres and in the submucosa.

Intestines.

In the intestines the most prominent feature is presented by the hæmorrhages, which are microscopically visible. In all parts of the intestines there are multiple small hæmorrhages in the mucosa between the glands. Sometimes the superficial cells nearest to the lumen of the intestine may show symptoms of commencing necrosis. More extensive hæmorrhages may be found in the submucosa, where they often form a thick layer several times as thick as the whole muscularis, which separates the mucosa from the muscularis, often circular in the whole periphery of the intestine, completely separating the mucosa from the basal layers. There are also numerous hæmorrhages between the muscular fibres of the muscularis separating them from each other. The blood-vessels are congested.

Another change which I often met with are the very typical lentiform infiltrations of the intestine, which from outside appear as small " cockades " of several millimetres diameter with a grey centre and a reddish periphery. Histologically those cockades correspond to a very marked lymphocytic infiltration of the solitary follicles with hæmorrhages in their peripheric parts. This lesion corresponds very closely to the well-known medullar swelling of the follicles in human typhoid fever.

Pancreas.

The pancreas is apparently not very much affected, but generally there are hæmorrhages in the tissue of the gland between the acini of more or less extent; in several cases it seemed to me that the hæmorrhages were especially marked in the Langerhan islets. The parenchymatous cells of the gland are not affected in a pronounced manner, but occasionally the cells seemed to be stained pink by eosin more than usual, and the nuclei would appear stained very intensely by hæmatoxylin.

The blood-vessels are congested, and sometimes there is a slight round-cell infiltration along the vessels.

Spleen.

There is slight infiltration of the follicles. The increased size of the spleen is especially due to development of the trabecular tissue, which with the low power appears in a marked eosin stain; many of the large cells are prominent from their bright eosin colour. With a high power it becomes evident that the blood sinuses of the spleen are absolutely filled with a great number of large polymorphous cells intensely stained by eosin and with a blue nucleus. These cells correspond to

phagocytic endothelial leucocytes or macrophages, which are filled with ten to fifteen red cells each, which sometimes may be distinguished by their characteristic form, though generally they are more or less dissolved, so that the whole protoplasm of the endothelial cells appears of a bright eosin red colour.

This phenomenon corresponds to the enormous destruction of the blood in the first days of disease mentioned below.

Occasionally also small hæmorrhages are seen in the spleen tissues.

It seems probable that the red cells lose their vitality by the toxin of the disease, so that they can be phagocytized in the spleen by the endothelial leucocytes, as it happens in a similar way in human typhoid fever. It is possible that the endothelial leucocytes play some important rôle in the production of antitoxins, and that they require the red cells as food for their increased activity produced by the infection with leptospira.

There are no other focal lesions in the spleen.

Lymphnodes.

The histological changes are very similar to those in the spleen.

Within the trabeculæ there are many endothelial leucocytes of the sinuses and the reticulum filled with red cells, which are in part dissolved, so that the protoplasm of the cells appears in a bright eosin colour.

There is some round-cell infiltration of the germinative centres.

Lungs.

The histological changes of the lungs as macroscopical lesions are very characteristic. All over the section there are seen numerous small irregularly-shaped foci of red colour corresponding to hæmorrhages, as can be defined by high power, which shows the red cells filling either the alveoli or in other parts the interalveolar septa and distending them. Those foci are found as well in the central parts as near the pleural surface. The vessels of the lungs are generally congested, and in transverse sections through the vessels there is always seen a marked increase of the white cells in the blood.

There are no other lesions in the lungs; sometimes there may be a slight infiltration with round cells in the hæmorrhagic foci. In the bronchi and in the trachea occasionally there are seen some small submucous hæmorrhages, and small bronchi may be filled with blood.

The pleura itself is not especially affected, though of course many subpleural hæmorrhages are apparent.

Heart.

In the fresh preparation the muscle fibres appear a little swollen, showing the protoplasm sometimes a little cloudy and slightly granulated. The content of the fibres appears in the form of irregular masses. The transverse striæ are not clearly seen, being almost invisible at times.

In fixed and stained preparations the muscle cells are often more intensely stained by eosin than is the rule, and transverse striation appears only in a few places and is not quite regular, often quite indistinct. Sometimes there are some small vacuolæ near the nucleus of the cell. The fibres appear of irregular shape, and the cytoplasm is changed into irregular hyaline masses. The blood-vessels are well filled and even congested. Quite commonly between the muscle fibres on many places there are hæmorrhages of more or less extent. Sometimes there is some slight focal round-cell infiltration around capillaries or in the interfibrillar spaces and in the connective tissue.

Some of the hæmorrhages are under the epicardium or under the endocardium.

The degeneration of the myocardium is probably due to the toxæmia. There is no necrosis of muscle cells.

Brain.

I have made in a number of cases histological examinations of the central nervous system, not so much with the idea of making a complete study, but more for my own information, because the central nervous system is so often attacked in a specific manner in spirochætal diseases.

In fact, I have seen that in the experimental leptospirilosis the central nervous system often takes part in the general infection. There is a marked congestion of the vessels and capillaries, and small hæmorrhages of the meninges and of the white substance are not seldom. Also in some cases I saw slight infiltration of the membranes and of the ependyma. It seemed to me that the nuclei of ganglia cells often showed a very indistinct staining of the nuclei. There may occur small hæmorrhages between the ganglia cells.

I found generally a strong injection of the vessels of the meninges, sometimes accompanied by some slight infiltration; likewise in the ependyma of the ventricles and the tela choroidea. Sometimes on those places there are some hæmorrhages. There may be some slight round-cell infiltration in the cortex near the meninges. Also in the brain the blood-vessels are filled with blood and extended, especially in the white substance; here and there may occur some small microscopical hæmorrhages in the tissue. The same changes I met in the cerebellum and its meninges.

Spinal Cord.

The spinal cord shows similar changes as the brain, especially strong injection of the blood-vessels of the meninges, occasionally with some round-cell infiltration. On several places small hæmorrhages may be seen in the grey and white substances. There are sometimes hæmorrhages between the meninges and slight cellular infiltration round the central canal.

Voluntary Muscles.

Without any exception I found in all the cases of leptospiral infection, where I looked for it, a severe degeneration of the striated muscle fibres, which is so typical, that I found it one of the best symptoms to make a diagnosis in a case of doubtful infectiou, when other symptoms were not characteristic enough or when leptospira could not be found in the dark field.

In fresh preparations the muscular fibres do not show their regular form, but are more or less irregularly swollen, of hyaline aspect, and the regular transverse striation has more or less disappeared in most of the fibres, so that only with difficulty some fibres may be found of a somewhat normal aspect with their striation.

Also in stained preparations those changes can be very clearly demonstrated. The content of the muscle fibre is more or less coagulated in irregular clumps, so that the fibres appear on one part swollen and on others attenuated, and the transverse striation is more or less destroyed. This degeneration of the muscle is known as Zenker's hyaline degeneration, and is especially well known from human typhoid fever.

The muscle fibres lose their striation more and more, and finally are dissolved into irregular formless clumps with disappearance of the nuclei.

There are generally to be found smaller or more extensive hæmorrhages between the muscle fibres, and occasionally some slight round-cell infiltration in the interstitial tissue.

Skin.

The skin, similar to the different mucous membranes, shows more or less extensive hæmorrhages in the subcutis.

After having finished the studies described till now, I have been able to make the same experiences in a series of guinea-pigs infected with *Leptospira icterohæmorrhagiæ*, which I could isolate from rats of the slaughter-house of Habana [2]. I have made the clinical observations and autopsies of some forty to fifty guinea-pigs through fifteen generations of infection with that strain. Of about ten animals I have made histological observations in the same way as I did in the icteroides animals. Also in a series of about twenty animals I did regular blood counts as in the icteroides animals.

The result of all those observations was that I never saw the least detail differing from the observations described in the icteroides animals, so that I only could repeat what I have written once if I wanted to give a description of those investigations.

I have had here the material to make for my better information comparative histological sections of the liver of cases of human yellow fever. I could convince myself again of the striking difference of those lesions from the experimental infection.

Fortunately I have been able to demonstrate my preparations to the best experts in the pathology of yellow fever, of whom I should mention Dr. Guiteras. I have also sent some of my sections, especially of the liver of the infected animals, to one of the first authorities in histopathology, Professor Hermann Duerck, in Muenchen, who was kind enough to write me his opinion, which completely agrees with the descriptions as I have just given them here, especially as to the character of the lesions of the liver. I want to thank Professor Duerck, in whose laboratory I began my histological studies twenty-five years ago, and to whom I feel so much indebted.

The most striking results of my observations for me was the fact that, from the histological examination, it was impossible for me to make a differentiation of the two leptospiral infections.

For many years I have been interested in the study of the blood changes in infectious diseases. In my opinion the blood counts help so much for the differential diagnosis that I should not like to miss them in any case; they have for me an importance which is not inferior to the observation of the temperature.

Thus, when I found it impossible to make any differentiation of the two experimental infections in the guinea-pigs after the results of my clinical, anatomical and histological observations, I hoped that perhaps an exact investigation of the blood might reveal some difference, especially so because the blood changes in Weil's disease and yellow fever in man are of two very distinct types, the former showing the pronounced leucocytic reaction as in spirochætal diseases, the latter the much less marked alterations as generally seen in protozoal infections.

It was clear that a definitive opinion was only obtainable if daily examinations were made in great series of animals. I thought it worth the great amount of work and time necessary to undertake that study. So in two series of each more than twenty guinea-pigs, the one infected with our Habana *Leptospira icterohæmorrhagiæ*, the other with Noguchi's *Leptospira icteroides* Mérida, I have made daily counts of the white and red cells and determinations of the hæmoglobin content during the whole course of the disease.

I may again state in advance, to facilitate the description, that these investigations, like those mentioned above, have not revealed any differences in the two series of animals, both showing the same very typical and characteristic changes of the blood in a completely identical manner. Though not of a practical use for the differentiation of the two strains, the blood changes are so important and interesting for the pathology and immunology of these infections that a somewhat detailed description seems justified, also with regard to their relations with general anatomopathological questions.

Leucocytes.

Regularly within twenty-four hours after the injection of the infectious material there would

appear a notable increase of the number of the leucocytes in the blood, generally to 12-16,000, and often up to 30-40,000. An exception is only made by a guinea-pig which was inoculated with a pure culture of *Leptospira icteroides*, which probably was much less rich in leptospira than the emulsion of organs, as used in the other cases; in this case the rising of the leucocytes was quite slow, and reached a considerable number (24,000) only after a week.

The first increase of leucocytes is transitory, and generally the number sinks within one to two days down to 8,000. Generally the temperature curve will show a slight remission of the fever corresponding to the first leucocytosis.

In the next days the number of leucocytes keeps low between 4-8,000, whereas the symptoms of the disease are becoming more and more serious, and the temperature runs between 40-41 degrees.

Only when the disease is approaching to the fatal end, when the resistance of the body begins to diminish, there will appear a new reaction of the leucocytes, which show a new increase to 16-20,000. It seems that in many cases this reaction comes too late, so that it will not be able to prevent the fatal end; so the animals die under symptoms of a rapid descent of the fever and collapse.

In other cases, however, it is evident that the high leucocytosis indeed may have a curative effect on the diseases. Fever and general symptoms are disappearing and death is prevented.

Also in the acquired resistance of artificially immunized animals and in the natural resistance of big animals the effect of leucocytic action cannot be overlooked, and was often demonstrated in my experiments.

However, it does not seem as though the leucocytic reaction will produce a direct cure by means of destroying at once the whole number of the infectious germs. This proves that these leptospiral infections observed by us, as to immunity reaction, follow the general character of spirochætal diseases. It is evidently not a rare event that some of the organisms escape the destruction by leucocytes, and they are those which, keeping alive somewhere in the body, later on are responsible for the relapses.

It seems that the number of spirochætes in the relapses is not always very high; but that they really are present I have been able to show by the dark field in several cases. For that reason I do not completely agree with those investigators, who are of opinion that in Weil's disease the second fever attack is not a true relapse due to the action of virulent organisms, but rather a kind of after-fever produced by the toxins of a great number of spirochætes which are suddenly destroyed in the internal organs under the influence of an increasing production of strong antibodies by the infected organism.

There is no doubt that in those relapses clinically we can make the same observations as in the first attack. The fever rises again after the decrease of the leucocytosis. Also the other symptoms will appear again and once more the danger for life becomes imminent. In the last moment again the leucocytes will present their mighty help, and in a much greater number than in the first crisis. But even now I have seen cases in which the spirochætes proved more vigorous than the protective powers of the body, as represented in the leucocytes; in such cases the fatal end is unavoidable and the animals die.

On the other hand, there are cases which clearly prove that repeated increase of the leucocytes finally, though not always, may result victorious over the repeated attacks of the infection.

When in the preceding description I have shown the coincidence which exists between the increase of leucocytes and the changes of the fever and other symptoms, I know very well that this must not necessarily mean a causal relation between the two phenomena. If the leucocytes have an immediate influence on the destruction of the spirochætes in the sense of a phagocytosis, if perhaps they take part in the formation of specific antibodies against the spirochætes, if finally they only serve to remove from the tissues the spirochætes previously killed—those are questions still to be dissolved by experimental work. Certainly there is no doubt that there must be some rules on which the relations between the two factors depend.

The differential count which I have made on the leucocytes did not show differences in both infections. I observed, at the time of high leucocytosis, a marked relative increase of the lymphocytes up to 60-70 per cent. Generally I saw a relative increase of the eosinophilic cells, representing as much as 5 or even 10 per cent. The counts of the nuclei of the white cells, according to Arneth, did not show marked alterations from the normal average.

It is easily seen that the leucocytic changes, which I observed in the two leptospiral infections, are corresponding to the specific alterations, which are well known in Weil's disease of man; they are essentially and on principle different from human yellow fever.

Coagulability.

I have observed that the coagulability of the blood is very much changed by the leptospiral infection. At the height of infection, and especially at the time of death, the blood, and again in both infections, is coagulating immediately as it leaves the vessels, or even in the vessels. If the blood is very fluid at post-mortem examination it is almost sure that there is no infection with leptospira.

Red Cells and Hæmoglobin.

There is a marked influence of the infection on the number of red cells and on the hæmoglobin content of the blood.

In all the cases immediately after the injection

of the infectious material I observed a rapid decrease of the number of red cells from seven millions down to four or three millions within a few days. The form of the red cells is generally not very much affected, though in severe cases there may be a slight degree of poikilocytosis and anisocytosis.

The histological findings in the spleen, as described above, explain fully the severe depravation of the blood in its composition. This also reminds me of similar observations known long since in typhoid fever.

If the liver stops and other symptoms disappear the number of red cells will soon return to the normal. In the relapses the same changes are observed as in the first attack.

Quite similar observations as on the red cells can be made on the hæmoglobin content of the blood, which sinks suddenly in a few days to 60, and soon to 40 per cent., but also in a few days may recover if the disease is cured.

Compared with the two human diseases, it appears immediately that the blood changes of the experimental infections are again in full correspondence with the well-known lesions in Weil's disease, whereas there is a marked difference from the yellow fever, in which the red cells and the hæmoglobin are not essentially affected.

Results.

There is no doubt that many of the changes here described are very different from what is known about yellow fever of man.

The relatively slight changes of the liver form the most striking contrast compared with the severe destruction of the parenchymatous tissue in human cases, where almost nothing is left of the hepatic cells.

The characteristic destruction of the red cells in the spleen by phagocytosis has not been described in human yellow fever.

The severe hyaline degeneration of the voluntary muscles, for so long so well known to pathologists, has never been mentioned in the pathological changes, which were so minutely studied in human yellow fever by the best observers, and it is well known that most competent pathologists have been seeking just for those changes in the muscles more than twenty years ago, but without result. It is almost impossible to think that such a typical lesion could have been overlooked.

The well-marked changes described in the intestine, which resemble the medullar infiltration in typhoid fever, have never been mentioned in yellow fever of man.

The severe degeneration of the blood, which I have always found in the animals, is a symptom which in no way belongs to the clinical picture of human yellow fever.

The high leucocytosis, corresponding to the typical blood reaction in most of the spirochætal diseases, is not known as a typical symptom of human yellow fever, and also the differential blood count is in no way similar to the type of changes in human cases, which is generally characterized by leucopenia and relative lymphocytosis and mononucleosis, as I have personally seen in a number of cases.

The prevalence of hæmorrhages does not appear in human yellow fever in such a pronounced way as in the experimental infection.

The affection of the central nervous system has not a similar importance in human yellow fever as in the experimental disease.

On the other hand, most of the changes mentioned just now are typical for Weil's disease in man, such as the less severe lesions of the liver, the phagocytosis of the red cells in the spleen, the hyaline degeneration of the skeletal muscles, the prevalence of extensive hæmorrhages in all the organs, the participation of the central nervous system in the affection, the severe degeneration of the blood and the marked leucocytosis of a type which is peculiar for spirochætal diseases.

Of course I know that it is nothing uncommon in experimental pathology that the symptoms and lesions in experimentally infected animals do not absolutely correspond to those of a natural infection in human beings, but it seems remarkable to me, and without parallel, that the germs of two diseases, which are so different in man, and which also always have been differentiated with all security, when they occurred at the same time in the same place in epidemics, produce absolutely identical clinical and anatomical effects in the experimental animal, all of them corresponding only to the one of those diseases and being in a striking contrast with the other one.

Finally, I should mention that perhaps the microscopical findings, as described here, may give some perspective on the pathogenesis of the disease, which in many ways seems to have something of the character of that nosologic group which we call the hæmorrhagic septicæmias.

It is evident that, as in many other spirochætal diseases, there is a very marked effect of the toxins of the germs, though we do not know the specific character of those toxins till now, as it has not yet been possible to isolate the spirochætal toxins for a detailed examination. The existence of such toxins seems to me to be quite certain from innumerable indications.

The toxins in our case, I think, are the cause of the severe destruction of the red cells. Those cells, once killed by the toxins, are taken up and destroyed in great numbers by the phagocytes in the spleen. I think it possible, and even probable, that this gives origin to the jaundice, which is such a prominent symptom of the experimental infection. This may happen in the way that the blood is changed into bilirubin, as sometimes I have really found the phagocytes full of bile pigment. The cellular changes in the liver undoubtedly are not severe enough to explain in a satisfactory manner the advanced jaundice, which is such a regular and prevalent symptom of the disease.

I think also that the frequent fatty degeneration and even complete necrosis of the parenchymatous cells of the suprarenals must be of essential importance in the experimental disease, as far as the troubles in the functions of this organ, or even the complete elimination of these functions, may be one of the principal causes for the lesions of the capillaries, which gives origin to the multiple hæmorrhages and to the severe degeneration of the blood, either directly or indirectly, by the want of production of neutralizing substances against the spirochætal toxins as it could be expected from the normal action of the adrenal bodies.

It would be interesting to investigate how far degenerative processes in the suprarenals may have an influence in the pathogenesis of leptospiral infections in man, especially of Weil's disease. Also in other spirochætal infections an examination of the same question might reveal new pathogenetic relations.

A thorough investigation of the histopathology and hæmatology in a large series of guinea-pigs, experimentally infected with a *Leptospira icteroides* (strain "Mérida"), isolated by Noguchi from human yellow fever, gave results absolutely identical with those found in another series of animals infected with *Leptospira icterohæmorrhagiæ*, isolated from Habana rats. There were no clinical and anatomical differences in the two experimental infections.

The histological changes in the organs are numerous and characteristic, and in all essential parts corresponding to those found in Weil's disease in man.

From the results of clinical, anatomical, histological and hæmatological examination in guinea-pigs infected with *Leptospira icteroides* (strain "Mérida"), I do not see any conclusive argument which would prove the ætiological importance which *Leptospira icteroides* "Mérida" may have as the causative agent of yellow fever in man. Most of the arguments in favour of the ætiological rôle of *Leptospira icteroides* are based on immunity experiments, though their value is not an absolute one. This paper does not deal with these. It was interesting for me that just when writing these last lines I received a remarkable publication from Brazil [3], from which I see that in a good number of yellow fever cases the serum tested with *Leptospira icteroides* "Mérida" by the Pfeiffer phenomenon gave constantly negative results.

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NOTES OF A CASE OF HÆMORRHAGIC PANCREATITIS IN A DOG.

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Towards the end of July Dr. Montgomery, D.D.M.S., brought a dog (well known in Lagos as "Our Miss Gibbs") to have her career cut short and be post-mortemed. She had been ill for about two weeks, having no definite symptoms except some fever and a total disinclination for food; vomiting it if forced upon her. Her latter condition was one of complete asthenia.

Post-mortem.—The body was well nourished and well lined with fat of a darker colour than usual—an ochre, in fact. The alimentary canal was apparently normal except for a small, healed, punched-out ulcer towards the pyloric end of the stomach. The lungs and heart seemed normal. No helminth or other parasites were seen. The bowel contained no food nor fæcal matter. There were no gallstones, and the liver showed no gross visible change. In the region of the pancreas some fatty necrosis of the mesentery was noticed. The pancreas was slightly harder than normal and appeared congested, with here and there minute external hæmorrhages. No blood was noticed in the abdominal cavity.

Sections of the pancreas showed groups of lobules separated by escaped blood in the connective tissue, and the lobules themselves in many cases showed marked laceration and necrosis of the tissue, the spaces between being filled with free blood and inflammatory product. The individual cells had undergone a process producing cloudy swelling. The Islands of Langerhans were also somewhat disintegrated. The ducts showed marked thickening of the walls.

This dog had a curious habit of swallowing red-hot burning cigarette ends (it has been known to swallow as many as eight at one time) without apparent discomfort to herself. Whether this fact has any connection with the disease is doubtful, although the ulcer might have been caused thereby.

Since then another dog has been examined and found in a state of advanced diabetes. The condition of wasting was noticed after he had fallen from a verandah. Unfortunately, by some mistake, a post-mortem was not obtained.

I am indebted to Dr. Montgomery for bringing this case to my notice.

The Immediate Influence of Alcohol Ingestion upon Diabetic Glycosuria and Blood Sugar (L. S. Fuller, M.D., *Journal of Metabolic Research*, vol. i, No. 5, May, 1922).—According to the author's experiments, the immediate effect of alcohol is to reduce both hyperglycæmia and glycosuria in most cases of mild or moderate diabetes. This effect is most pronounced when the alcohol is substituted for the caloric equivalent of fat, but is also frequently manifest when the alcohol is given as an addition to the previous diet. These effects are usually lacking in diabetic cases of great severity.

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THE THERAPY OF INTESTINAL FLUX.

LATELY we have seen several communications from the tropics of a therapeutic agent introduced by Mr. Ainslie Walker named "Dimol." The ailments it has been administered for are those of the alimentary canal attended by intestinal flux due to or following parasitic infection. It is some years now, in fact during the late war, that we first heard of the preparation, and we gathered that Mr. Walker advocated its value, after carefully reporting upon its virtues. We are anxious to learn the components of the medicinal agent, so that we may get more exact acquaintance with it. It has been used by practitioners in India for many ailments, and acclaimed as a potent agent in dealing with pathological infections in the matter of the intestinal flora. Several such infections are stated to have been treated successfully, and we are looking for definite news of the infections it counters and the form of action it is endowed with. Dimol was primarily introduced as a means of stemming the intestinal fluxes that result from infections ranging from diarrhœa to dysentery, ankylostomiasis, and choleraic types of illness, &c.

We have long been harassed with "bactericides," "intestinal disinfectants," "said to be effective in the diarrhœa of children," "summer diarrhœa," "intestinal antiseptics," "a mouth, œsophageal," and "stomach antiseptic," &c. The majority of these compounds are proprietary, that is to say, their component elements are not declared outright, and their carbolic co-efficient on *B. typhosus* according to the Rideal-Walker test is so-and-so. Of these we read of, the more common are: Izal, lysol, cyllin, Jeyes' fluid, cresol, kerol, cresylic acid, and many derivatives of these are especially commended for dysentery, diarrhœa, choleraic attacks, and, as a finale, to complete the symmetry of the sentence, sprue is usually added. The ailments these disinfectants, antiseptics, &c., are given for almost all point in the same direction, namely, intestinal fluxes, and now to these "Dimol" is added by Mr. Walker as a specially useful drug. These more or less mysterious compounds in which the active principle is hidden and the nature of the ailments they are said to cure are mere symptoms and not a disease, so that we are neither cognizant of what we are treating nor of the nature of the drug we are assumed to be treating them with. Are we presumed to be treating the cause of the disease or merely alleviating the condition the parasite, the bacterium, or the worm has set up in the tissues of the organs which are the seat of the ailments? Take dysentery, for instance. Are we by these intestinal disinfectants destroying the parasitic or infective agency, or is it the sequelæ stage set up in the wall of the intestine itself? That we have really two such stages to deal with, viz., the acutely active lesion and the post-dysenteric stage, is evident. The drug being used may be capable of dealing with both stages, the active or initiative, and later that of mucous colitis which supervenes. Dysentery was formerly treated by ipecacuanha root, but nowadays by emetine alone, and the other materials of the plant thrown aside. The effect is that the initial hæmorrhagic stage may be cured by the emetine, which is without remedial effect when the muco-colitis stage is reached, and unless ipecacuanha root is used on this post-dysenteric stage the muco-colitis will continue or

may recur again and again. That this may reappear with or without a reappearance of the amœba in the evacuations would seem to be the case. The post-colitis may be, and usually is, not dependent on the presence of the amœba, but due to the damage done to the mucosa itself.

The ultimate condition the colon assumes is to be seen by examination of the lower 10 inches of the bowel by the sigmoidoscope. Those who make a rule of using the sigmoidoscope are familiar with the congested, inflamed and ulcerated 2 inches of the bowel at the point where the sigmoid flexure joins the upper end of the rectum; and the fact that the inflamed and ulcerated patch can be cured by touching this diseased patch with pure carbolic acid demonstrates that the cure is brought about by treating the diseased bowel as a simple surgical abrasion or ulceration. This affords further proof that it is not recurring amœbæ that are setting up the post-dysentery colitis, but the simple ulcerative stage which resulted, or a lesion in the mucosa due to the damage which followed upon the dysenteric infection. It is during the stage that follows the acute dysentery stage that the intestinal disinfectants are brought into the course of the treatment; in fact, the stage when no infecting amœbæ are present and only the sequelæ stage when the intestinal flux is due to damaged mucosa. That these do good is due to non-amœbic stages of the illness in which a fresh flora of infection from *B. coli* and pyogenic bacteria are associated with the muco-purulent discharge which continues from the damaged bowel.

The list of disinfectants given above may in fact be useful when the contents of the bowel are thus affected, and to this "Dimol" may be added, it is hoped, with benefit. We hope Mr. Ainslie Walker will continue to study yet more closely the effect of the intestinal disinfectant he has introduced and to decide to what category we may assign its virtues. Most of us know the useful part he played in medicine when he co-operated in establishing the Rideal-Walker test, and adding thereby a foundation of real scientific value which has given us a "foundation of belief" in one important branch of medicine.

We are persuaded of the continuance of post-dysenteric states after a course of emetine by which the acute lesion is cured; yet the muco-colitis remains; and in spite of dietetic care, repetition of emetine injections, long tube (so-called) washing out of the lower bowel, &c., the muco-colitis continues for an indefinite time. When in earlier days ipecacuanha itself was administered for dysentery, the post-colitis which we see so frequently nowadays was almost unheard of, at any rate much less frequently than now. Emetine is not ipecacuanha, neither is morphia opium, a platitude no doubt, but like many other such platitudes, both are significant, although we do not give the statements full consideration and thought; for their therapeutic actions are well-nigh things apart.

In all we hear of "Dimol," it is the flux that accompanies or follows on intestinal ailments in which it is spoken of as potent and useful, and we would hope to hear more of its clinical uses in such cases as those referred to above.

Editorial Notes.

YAWS IN CEYLON.

For many years past yaws (frambœsia, parangi) has been a scourge of Ceylon, in certain districts practically every native child being infected with it. It is sufficient to mention that in the year 1920 more than 30,000 cases of the disease were treated in the outdoor dispensaries organized by the medical department. Some months ago a Committee was appointed by the Government to inquire into and report upon the prevalence of parangi in the island, with a view to making provisions for coping with the disease. The Committee consisted of the Hon. Dr. G. J. Rutherford (Chairman), Hon. H. W. Cordington, Hon. and Rev. W. E. Botejue, Dr. Lucius Nicholls, and Dr. R. L. Spittel. The Committee have now published their very interesting report, of which we give the conclusions:—

"The number of cases of parangi treated at Government dispensaries during the last five years was considered, also the reports from various Government agents of the incidence of the disease in each Province, and it was found that the incidence was very large and the disease was scattered over nearly all the Provinces, except portions of the Northern and Western Provinces and in the hill country in some Provinces.

"Recommended that a map be prepared giving the infected areas in each Province, and that a central office be established in Colombo to deal with the disease (this should be under the control of the Director, Bacteriological Institute), and that a campaign be started in definite districts with the object of treating all infected persons in that area.

"Recommended that compulsory notification through the headmen and compulsory treatment in declared areas (as is done in anchylostomiasis, under the Quarantine Campaign), and Prevention of Diseases Ordinances be instituted.

"Recommended that a Senior Medical Officer to work under the Director, Bacteriological Institute, be appointed; he should receive the same salary as the Director of Hookworm Campaigns and special allowances, and that four additional Itinerating Medical Officers, in addition to the three at present employed, be engaged. They should receive a liberal salary and allowances, as the work in villages is very arduous, unpleasant and unhealthy.

"Recommended that ample supplies of neosalvarsan or similar drugs be provided; at present about 3,000 ampoules of neosalvarsan are being used per month in the treatment of parangi and syphilis. It is considered that if an intensive campaign be started with eight officers working, in

addition to those at the various hospitals and dispensaries in the country, large stocks of the drug are necessary, so that when the campaign is started it should not be closed for want of drugs and equipment.

"Recommended that the Finance Committee be asked to provide funds for the payment of officers and drugs mentioned at an early date. It must be noted that this campaign, if it is to be carried through so as to be of permanent good, will cost a considerable sum, but the expenditure should decrease every year, and that the first few years will be the most expensive, as the incidence of the disease, and consequently the number of cases that have to be treated in the hospitals, dispensaries and by the Itinerating Medical Officers, should decrease annually.

"Number of cases of parangi treated in the outdoor dispensaries during the five years 1916 to 1920:—

"Western Province: 1916, 621; 1917, 627; 1918, 809; 1919, 939; 1920, 1,550.

"Central Province: 1916, 1,962; 1917, 2,205; 1918, 1,674; 1919, 1,779; 1920, 1,766.

"Northern Province: 1916, 936; 1917, 785; 1918, 897; 1919, 1,013; 1920, 899.

'Eastern Province: 1916, 3,863; 1917, 4,928; 1918, 5,952; 1919, 6,771; 1920, 6,525.

"Southern Province: 1916, 4,177; 1917, 4,412; 1918, 4,657; 1919, 4,497; 1920, 4,411.

"North-Western Province: 1916, 11,566; 1917, 12,861; 1918, 12,279; 1919, 11,269; 1920, 11,296.

"North Central Province: 1916, 4,964; 1917, 3,729; 1918, 3,913; 1919, 4,568; 1920, 4,989.

"Province of Uva: 1916, 1,671; 1917, 1,990; 1918, 1,780; 1919, 2,509; 1920, 2,512.

"Province of Sabaragamuwa: 1916, 806; 1917, 815; 1918, 662; 1919, 838; 1920, 1,123.

"Total: 1916, 30,566; 1917, 32,352; 1918, 32,623; 1919, 34,183; 1920, 35,071."

It is hoped that the financial position of the Colony will soon improve and permit the Ceylon Government to adopt and carry out the measures recommended by the Committee.

A. C.

RAT-BITE SPIROCHÆTOSIS.

The part played by rats in the transmission of spirochætal infection has recently formed the subject of papers and discussions at two separate Society meetings. On October 17, at the Section of Pathology Meeting at the Royal Society of Medicine, Drs. R. D. Passey and J. H. Ryle reported a rare instance in England of a probable case of *Spirochætosis icterohæmorrhagica* (infective jaundice) occurring at Guildford. The precise nature of the patient's illness was not suspected until late in its course, when search failed to demonstrate the presence of spirochætes in the blood and urine, and serum agglutination tests against the specific spirochæte (*Leptospira icterohæmorrhagiæ*) also proved negative. But the clinical features of the case shown by the temperature chart, the marked prostration, jaundice and skin eruption closely resembled cases of spirochætal jaundice such as were familiar in Flanders during the war. Furthermore, it was ascertained that the premises occupied by the patient had been infested with rats, some of which were subsequently caught, and a few found to show spirochætal blood infection. The association therefore pointed to the strong likelihood of the correct nature of the case thus described as spirochætal jaundice. The disease, though more common on the Continent, and in America known under the name of Weil's disease, has been seldom met with in England. A suggestion was made by Dr. C. J. G. Ledingham, President of the Section, that occasional outbreaks of apparently infective jaundice occurring in schools were possibly spirochætal in origin, and that a clue to their nature might be supplied by investigation into the source of infection from rats.

On October 19 Dr. R. Row, at the Royal Society of Tropical Medicine and Hygiene, gave an account of rat-bite fever in India. In referring to the geographical distribution of the disease, he laid stress on the fact that text-books have omitted mention of its existence in India, and describe it as occurring in Japan, China, the United States and certain parts of Europe. Despite this omission, he affirmed that rat-bite fever had been prevalent in India for many centuries, and referred to accounts given by Sanskrit authors as far back as 300 A.D., whose description in most respects tallied closely with the features of the disease as known at the present day. Its prevalence in India was largely due to native reluctance to destroy animal life, a peculiarity which served also to explain the endemicity of plague.

Dr. Row by means of lantern slides demonstrated the typical appearance of the primary wound, usually developing into a circular raised ulcer, but occasionally much aggravated by septic infection and by the native custom of treating the wound by application of a mass of rats' fæces.

The secondary manifestations appear after an interval of a fortnight or longer when the original wound is well on in process of healing or healed. Accompanied by high fever and prostration, there also occur skin eruptions in the form either of urticarial wheals sparsely scattered over the limbs, or as reddened papules, occasionally purpuric, or more freely distributed, and, as in a case shown on the screen, sometimes involving the hands and greater part of the face.

The course of the fever, as shown by the temperature chart, recalled that of relapsing fever in the periodic elevation and remission extending over several days respectively, and displaying three or even four such periods alternately, before finally subsiding to the normal, but proving amenable to treatment by novarsenobillon.

Until quite recent years much confusion prevailed as to the precise nature of the infection, and undue reliance was placed in the finding of

pyogenic organisms, such as streptococci of purely secondary infective origin; Schottmüller and Blake and other workers had also erroneously attributed the causation to a streptothrix in 1914. A year or two later, however, the researches of Tutaki, Takaki and other investigators in Japan successfully established the spirochætal origin of rat-bite fever by the discovery and cultivation of long, slender spirochætes with tapering ends and terminal flagella both from the primary wound and secondary skin eruption, and named *Leptospira morsus-muris*. Dr. Row himself, working in Bombay, had also succeeded in demonstrating the presence of spirochætes in the bloodstained serous fluid expressed from the primary ulcer, and by obtaining blood from the hyperæmic zone surrounding the ulcer, and from the secondary skin lesions he had been able by inoculation to transmit the infection to mice, and also guinea-pigs and a monkey.

Specimens of the spirochætes derived from one or other of these sources were exhibited both under the microscope and by means of microphotographs on the screen.

The spirochætes which he had found in the Bombay cases of rat-bite fever differed considerably from the type associated with the disease in Japan, as described by above-mentioned observers there, in that they were much smaller in size, and usually showing only two spirals when seen separately. Occasional end to end apposition gave the appearance of a larger number of curves, but close inspection showed the point of separation of the two spirochætes. The free ends were not tapering, and he had quite failed to find any terminal flagella. He proposed to call the small form he had found *Spirochæta pettiti*, partly on account of its small size and partly in honour of the worker of that name.

In the discussion on the paper, Dr. Arthur Powell amply confirmed Dr. Row's valuable observations both as to the prevalence of rat-bite fever in Bombay and its causation by the spirochæte described, which he himself had identified in cases under his care. From his experience of rat-bite fever in the Bombay Police Force, he roughly estimated its incidence as being about one per thousand. J. G. F.

Annotations.

Spider Bite of Glans Penis simulating an Acute Abdominal Condition (W. S. Woody, B.S., M.D., Hopewell, Va., *New York Medical Journal and Medical Record*, May 3, 1922).—The patient, a negro, aged 62 years, complained of pains in the back and upper abdomen. The pain was severe. He had been quite well half an hour previously. While seated on a privy he felt something on the glans penis as a slight sting, and saw a spider, a small one and insignificant-looking. In fifteen minutes he felt pain in the lower abdomen, and in a few minutes it spread to the upper abdomen and lumbar region. Five minutes later he was suffering intense agony.

Examination showed no mark. The entire abdomen was board-like with rigidity and sensitive to pressure. Temperature, 98° F.; pulse, 62; cold perspiration, intense suffering. A ¼ gr. of morphine failed to relieve. He described the pain as a rather severe, dragging ache, and in the lumbar region, with intense itching in the soles of the feet. He was still in pain and unable to sleep. Temperature, 99° F. Patient catheterized. Examination of the urine showed a heavy cloud of albumen. Blood count, 4,300,000 red and 7,200 white cells. The bladder distended above symphisis. Catheterization done, and a full dose of magnesium sulphate. On the third day the patient was in a "typhoid state," headache, dull pain in back and abdomen. Abdomen much distended. No peristaltic movements heard. Bladder much distended. Temperature now 100·6° F.; pulse, 102. The sclera showed jaundice. He voided voluntarily for the first time and was much improved. Abdomen not distended. A blood count was taken, showing 4,000,000 red cells and 7,000 white ones. A mild epididymitis developed.

Dr. J. C. Da Costa says in a short paragraph: "The bite of large spiders is productive of inflammation, swelling, weakness and even death. The bite of the poisonous spider of New Zealand produces a large white swelling and great prostration. Death may ensue, or the victim remain in a depressed, enfeebled state for weeks or even months."

Additional Note on the Cladosporium Wernecki Horta, 1921 (M. Langeron and P. Horta, *Bulletins de la Société de Pathologie Exotique*, vol. xv, No. 6, June 14, 1922).—One of the authors has described the lesions produced by this fungus, discovered in Brazil in a patient, a white man, aged 47 years, These took the form of black spots which appeared on the hands, and resembled the "tinea nigra" described by Castellani and Chalmers. The parasite, however, appears to be very different from *Cladosporium mansoni* (Castellani) by its aspect in the squama and by its morphology in the cultures. The examination of these parasites shows a very remarkable polymorphism. In short, the Cladosporium can give, as Laurent, among others, has already shown, the forms Fumago and Dematium. Planchon, on the other hand, separates distinctly the Cladosporium and Hormodendron from the Dematium. The author's observations, which are in accord with those of Laurent, prove the inter-relationship between these three conditions. They have obtained the conidia of the type Cladosporium, but they have not yet seen appearing in their cultures any sporophores set up as in certain Cladosporium, nor the arbuscules of the type Hormodendron. Nevertheless, it appears interesting to the authors to point out this polymorphism, which throws some light on the real nature of this

parasite, and which shows its relationship with saprophyte fungi which are widespread throughout nature.

On a Fungus of a Brazilian Otomycosis: Sterigmatocystis Hortai (Maurice Langeron, *Bulletins de la Société Pathologie Exotique*, vol. xv, No. 6, June 14, 1922).—The champignons of the group Aspergillus grow naturally in the cerumen. Dr. Parreiras Horta has entrusted to the author the study of a champignon of this group, found at Rio de Janeiro, in the ear of one of his patients. It was found that the entire auditory duct was obstructed by a membrane of a dry nature, which extended to the tympanum. This last was quite intact. This membrane was removed, and from this material Dr. Horta was able to isolate, in pure culture, the champignon, the study of which he entrusted to the author. The cure of the malady was achieved by repeated applications of iodoglycerin. A short account of the characters of the cultures is given.

The author finds that this Sterigmatocystic does not seem to correspond to any of the known species, and thinks it expedient to dedicate it to Dr. Horta, the champignon to be known by the name of *Sterigmatocystic hortai*.

The Tetanus Bacillus as an Intestinal Saprophyte in Man (Carl Tenbroeck, M.D., and Johannes H. Bauer, M.D., *Journal of Experimental Medicine*, vol. xxxvi, No. 3, September 1, 1922).—The authors come to the following conclusions:—

(1) The only reliable method that can be used for the detection of tetanus bacilli is the culturing of the suspected material, the isolation of tetanus-like organisms, and the demonstration that the pure cultures form a spasm-producing toxin that is neutralized by tetanus antitoxin.

(2) Using this method, the authors have demonstrated tetanus bacilli in 34·7 per cent. of stools from seventy-eight individuals in Peking.

(3) The tetanus bacillus is growing in the digestive tract, for it is present in individuals who have been on a practically sterile diet for a month or more, and one individual may eliminate several million spores of tetanus bacilli in a single stool.

Yaws: Its Manifestations and Treatment by Neo-arsphenamin (Perpetuo D. Gutierrez, M.D., *Archives of Dermatology and Syphilology*, vol. vi, No. 3, September, 1922).—Yaws is prevalent in the village of Paranaque, affecting the poor for the most part, particularly children.

The disease is transmitted by direct contact. Many of the children in the locality were found to be affected with scabies, and it was believed that this was responsible for the transmission of the disease.

There are three types of secondary eruptions: the framboesiform, the papular and the macular. The macular eruption is described in detail. A new lesion associated with secondary eruptions is described as ichthyotic shins. Three tertiary lesions are described.

The disease yields readily to neo-arsphenamin therapy. In 275 patients treated, there was a clinical cure in 94·52 per cent. The observation in these cases extended from one and a half to three months. The secondary eruptions yielded best to the drug, the macular forms best of all. The primary lesions and tertiary keratotic lesions of the palms and soles did not do well.

Experience with Chaulmoogra Oil Derivatives in Treatment of Leprosy (Howard Morrow, M.D., Ernest L. Walker, S.D., and Hiram E. Miller, M.D., *The Journal of the American Medical Association*, vol. lxxix, No. 6, August 5, 1922).—Some twenty-five cases of leprosy at the San Francisco Hospital were treated by the authors with the esters of chaulmoogra oil, and the article gives the detailed results in these cases, which were found to be much at variance with the authors' expectations and the impression obtained from literature on the subject.

The system of parolling patients and giving them weekly injections of the ethyl esters for a further period of two years, after their period of treatment in hospital, was found to be a good one, and with the continued medication there will be fewer recurrences, and many more patients are likely to be permanently cured.

A Case of Mycetoma of the Foot with Nocardia Maduræ in a Native Algerian (M. Raynaud, J. Montpellier and A. Lacroix, *Bulletins de la Société de Pathologie Exotique*, vol. xv, No. 6, June 14, 1922).—The case which is here reported is the sixth of its kind in Algeria, and the third which has occurred in the one district in a single year. From this fact it appears that this disease is not so rare as is generally believed. This special patient was sent to hospital with the diagnosis of tuberculosis of the bones of the foot, and it is very probable that errors of this kind are by no means rare. A short account of the clinical history of this case is given, followed by an outline of the results of examination by radiography, and experiments by culture.

Aseptic Pyotherapy in the Treatment of Typhus Exanthematic (Le Bourdelles, *Bulletins de la Société de Pathologie Exotique*, vol. xv, No. 6, June 14, 1922).—Aseptic pyotherapy was used with good results in the treatment of horses suffering from various diseases. In 1919 the method was applied to human beings in the treatment of typhus, and good results were obtained.

The author goes on to give his own experience of this treatment, and a short account of the results obtained.

The action of the pyotherapy is not yet quite elucidated, but the author mentions several hypotheses.

The Presence of Non-iodophil Amœba in French Pigs (L. Cauchemez, *Bulletins de la Société de Pathologie Exotique*, vol. xv, No. 6, June 14, 1922). During the year 1920, 300 examinations of the dejections of pigs were made, and the frequent presence of iodophil amœba was ascertained. On the other hand, these experiments brought to view, on three occasions, the presence of a non-iodophil amœba. The author goes on to give a detailed description of the size and nature of the latter, and the varying views held on the subject by different experimenters. The question of how this non-iodophil amœba comes to be in the intestine is then considered.

In conclusion it may be stated that these few observations of the non-iodophil amœba show that in France this protozoon, already established in America and Germany, may be found in pigs. Its habitat is the terminal part of the large intestine, and no defined pathological rôle can be attributed to it until further information is forthcoming.

Mixed Cultures of Pure Strains of Fibroblasts and Epithelial Cells (Albert H. Ebeling and Albert Fischer, *Journal of Experimental Medicine*, vol. xxxvi, No. 3, September 1, 1922).—The authors come to the following conclusions:—

(1) Strains of epithelium and fibroblasts cultivated side by side in the same medium keep their individual characteristics. When sectioned and stained by the Van Gieson method, the cultures show the epithelium stained greenish yellow and the fibroblasts and their fibrillæ pink.

(2) There are no transition forms between the epithelial cells and fibroblasts.

(3) The epithelial cells belonging to an older strain are still able to form primitive structures of winding tubules with typical glandular epithelium.

(4) Under the conditions of the experiments no differentiation takes place.

Four plates are given, with explanatory notes on each.

Granuloma Inguinale with Lesion of the Lower Lip (B. Barker Beeson, M.D., *Archives of Dermatology and Syphilology*, vol. vi, No. 3, September, 1922).—The author describes a case of granuloma inguinale in a negro. The patient first exhibited ulcers of the groin and later an ulcer on the lower lip, from which, as well as from the inguinal lesion, the characteristic organisms were recovered. Only seven cases with this combination of symptoms were found in the literature. This is of interest because of the statement by Drs. Parounagian and Goodman: "As far as we know there has been but one other case with lesions of the lip, reported by Sequeira." The patient was cured by intravenous injections of tartar emetic.

Relapsing Fever in California (LeRoy H. Briggs, M.D., *Journal of the American Medical Association*, vol. lxxix, No. 12, September, 1922).—A man and his wife while camping in California were probably bitten by some suctorial insect, presumably a bedbug or a tick, although this cannot be proved. In each case, eight days later, a paroxysm of chills, fever, malaise and prostration ensued and lasted three days. In the case of the husband three relapses occurred, each more severe than the preceding. With the wife two relapses occurred, also of increasing severity. During the four observed paroxysms, spirochætes were found in the peripheral blood in increasing numbers. Intravenous injection of 0·45 grm. of neo-arsphenamin promptly terminated the infection in both instances.

Current Literature.

THE INDIAN MEDICAL GAZETTE.

Vol. LVII, No. 8, August, 1922.

Filariasis at Puri (S. K. Roy, M.B.).—Puri is a notorious endemic area of filariasis. About 27·3 per cent. of the population there harbour microfilariæ in their blood, and about 28 per cent. exhibit the clinical manifestations of filariasis.

For the proper elucidation of the question of endemicity of filariasis, the geographical, topographical and racial distribution of filariasis, as well as the ecology of carrier-mosquitoes, should be studied, and it is here shown how the conditions prevailing at Puri are favourable to the prevalence of the disease.

Observations on microfilariæ in man and in mosquitoes, based upon innumerable blood examinations for the last fifteen months and upon 700 dissections of mosquitoes, are given.

Details of the physiology of the different parts of the microfilariæ and of its development stages are given, and the article is concluded with a description of the treatment of filariasis at Puri, and of elephantiasis and filarial fever with antimony injections, detailing the reactionary symptoms after the injection.

Observations on "Ulcus Tropicum" in North Palestine (K. C. Sen, M.B.).—It is notorious that in North Palestine any abrasion tends to go septic. No cases of tetanus, however, have been reported With the advent of summer most of the insect pests of human existence arrive, and during their prevalence, the special kind of septic sore known as "Ulcus tropicum" is noticeable. Ulcus tropicum is not the notorious oriental sore.

Investigation of Ulcus tropicum was made in about twenty-one cases, and details of the ætiology, organisms and symptoms are given, together with an account of the various lines of treatment tried. A few cases are given to illustrate the effects of treatment.

Note on the Relative Rate of Absorption of Solar Radiant Heat of Silt-laden Waters (A. D. Stewart, Major, I.M.S.).—The utilization of silt-laden waters for the mitigation and the improvement of agriculture has long been carried out in Italy, and the beneficial results recognized. It is possible that the optimum conditions for the production of wet crops may turn out to be the conditions most inimical to the larval life of the anopheles. One of the chief results of this land treatment is undoubtedly a reduction of the anophelines, and an investigation of the factors productive of this result is of interest.

The anopheles prefers and requires a clear water for the development of its larvæ, and these larvæ die in water of a temperature of over 35 degrees. Observations were made to determine whether silt-laden water might absorb radiant heat at a greater rate than clear water, and whether the resultant higher temperature thus attained might be one of the conditions unfavourable to the anopheline larvæ in such water.

Comparison between silt-laden river water and distilled water, from this point of view, is striking, and tables are given showing the results.

It is suggested that the quicker absorption of solar radiant heat by a silt-laden water and the higher resultant temperature are possibly factors operative in nature in the reduction of anopheline mosquitoes in areas flooded by such water.

Remarks on the Typhus Fever of Kumaon, and on the Suggestion that it is Transmitted by a Tick (F. W. Cragg, M.D.).—It has been suggested that the fever at Bhim Tal is closely allied to the spotted fever of the Rocky Mountains, and that it is transmitted by the tick. This article suggests that it is none other than the ordinary louse-borne typhus.

There is a strong probability that typhus fever is endemic in the Kumaon hills, and it almost seems that the conditions at Bhim Tal are specially favourable to outbreaks of typhus, and that persons who would not ordinarily run the risk of suffering from louse-borne disease are exposed to unusual chance of infection there.

The author describes the position of Bhim Tal and the constant stream of traffic which passes through it, and also the very great possibilities of lice being transmitted from the coolies to visitors and travellers. He considers that the case against the louse is as strong as that against the tick.

Toxic Jaundice of Unknown Origin in the Andamans (A. Bayley de Castro).—In the *Indian Medical Gazette* for July, 1913, there is an article by Major Woolley, entitled "Malaria in the Andamans—Fever with Jaundice Cases," and another in the same paper for December, 1920, entitled "A Case of Acute Catarrhal Jaundice," by the author of this present article. These cases bore much resemblance to each other.

In this article the author gives brief notes on several cases which have since come under his notice. He inclines to consider these cases entirely distinct from malaria and its causation. Comparison is made between these cases and cases of dengue, yellow fever, malaria, &c.

The salient features of the disease are summarized as follows:—

(1) Slight initial rise of temperature for a day or two.

(2) Marked increase in the pulse-rate with a normal temperature.

(3) Congested condition of the eyes at first, later jaundice.

(4) Very acute pain in the thighs.

(5) Jaundice of an intense degree.

(6) Hiccough.

(7) Hæmorrhages, and lastly, perhaps, may be added,

(8) An increase in the eosinophile corpuscles.

A symptomatic line of treatment seems to be best. There is not the slightest indication for quinine. Hydrotherapy was resorted to in all cases, and abundant demulcent drinks were given.

No *Spirochæta icterohæmorrhagica* was found in any of the smears of blood examined. The author does not think that the rod-like bacilli, mentioned before, are specific of the disease.

Primary Carcinoma of the Liver (W. Leonard Forsyth).—During the last few years three undoubted cases of carcinomata, primary to the liver, have come under the notice of the author. A clinical précis and a post-mortem report of the last of these is given in this article.

The author is of opinion that these cases occur more frequently than we believe.

Some Contra-indications to the Intra-capsular Operation for Cataract based on 8,000 *Cases by an Intra-capsular Operator* (Dr. H. T. Holland, M.B., Ch.B., F.R.C.S.E.).—The author states that he is altogether in favour of the intra-capsular operation for ordinary senile cataract, and that he himself does quite 95 per cent. in the capsule. He thinks that the operation would have had fewer critics, had its advocates more frankly admitted the limitations of the operation, in a certain percentage of cases.

Lt.-Col. H. Smith clearly lays down that the following classes are unsuitable for intra-capsular extraction:—

(1) All cases of congenital cataract.

(2) Juvenile cataracts up to 30 years of age.

(3) After-cataract, also called secondary cataract.

The author gives briefly five additional contra-indications to the intra-capsular operation, not from any lack of belief in that operation, but in the hope that by frankly admitting certain contra-indications, the intra-capsular operation will become more widespread than it is at present.

Post-mortem Examination in Cerebral Malaria. A New and Simple Method of Demonstration Parasites in the Capillaries of the Brain (R. N. Raja, L.R.C.P., L.F.P.S.).—A piece of brain tissue from the cerebrum or cerebellum is pressed between two slides, and the material thus obtained is transferred to a clean slide and spread out with the edge of another slide, taking care to draw the spreader in only one direction. The smears are dried in the air or over a flame, fixed with alcohol or equal parts alcohol and ether, and stained by Giemsa's method or by diluted Leishman's stain; or they may be stained by the ordinary Leishman's method without preliminary fixation. Smears prepared in this way usually contain several portions of capillaries of varying lengths which, in cases of cerebral malaria, are filled with malarial parasites.

Four cases of cerebral malaria have come under the notice of the author at the post-mortem examination, in all of which the parasites have been clearly demonstrated by the above method.

A few remarks are given on each of these cases.

Medical News.

NATIONAL MEDICAL ASSOCIATION OF CHINA.

We have been informed that a branch of the National Medical Association of China has recently been organized at Peking, with Dr. S. P. Chen as President; Dr. Fong, Vice-President; Dr. A. W. Woo, English Secretary; Dr. Chi Po, Chinese Secretary; and Dr. George Char, Treasurer.

ELEPHANTIASIS IN VENEZUELA.

In his illustrated report to the Venezuelan Medical Congress, Dr. Rodriquez Rivero shows that elephantiasis, or *infundia* as it is known locally, is very prevalent in Venezuela, though few of the cases appear to be caused by filaria. One case developed after the bite of a very large ant (bachaco).

Correspondence.

To the Editor of The Journal of Tropical Medicine and Hygiene.

September 13, 1922.

Dear Sir,—I have read with interest your leader on "Mushroom Poisoning" because of a personal experience, which may perhaps be of interest to you.

About a year ago my wife picked some mushrooms in a eucalyptus plantation near our house, and these were cooked for breakfast the next morning. I picked up a piece on my fork, and immediately on tasting it recognized that there was something wrong; the flesh was tough—it tasted "wrong," is the best way I can describe it. I rejected this piece, but before this happened both my wife and I ate several pieces which seemed right. Within the next hour I had motored ten miles to town and was dictating a letter. I had occasion to look at some reference in the course of the dictation, and noticed that I could not focus properly—the printed letters seemed blurred and grey. Although rather surprised at this, I continued dictating until, quite suddenly, I felt cold, my head buzzed, and my feet felt heavy. I felt my pulse; it was thready and irregular, and I felt as if I were enveloped in a moist film of air. My typist noticed that there was something wrong, and I sent her out of the room. I then walked into my laboratory adjoining the room I was dictating in and had to sit down, as I felt faint. It was only then that I connected my condition with the mushrooms. I looked into a mirror, and found my pupils dilated, my face grey and covered with perspiration.

With the idea of washing out my stomach, and perhaps diluting the poison, I rapidly drank a large quantity of water—about six tumblersful, I think—and then induced vomiting. This left me rather weak, but I felt better. By this time my typist telephoned to several medical friends, and one of them came in just as my wife did. She had practically the same symptoms as myself, but did not connect them with the mushrooms, as she had not eaten "the wrong kind." Our medical friend insisted on our going to hospital, where we remained for twenty-four hours. We experienced no ill-effects beyond those described, no doubt due to the prompt induction of vomiting, because, curiously enough, within the next few weeks two cases of death due to eating the same variety of mushrooms were reported locally.

The interesting point is that I am certain that I did not swallow any poisonous mushroom, and it seems to me that, at least in my case, the poisoning was due to some water soluble poison being absorbed by the good mushrooms during cooking. Perhaps this is one of the reasons for the comparatively mild effects produced.

Yours faithfully,
P. J. Orenstein.

Department of Sanitation,
The Corner House.
Johannesburg.

Original Communications.

A CASE OF HUMAN INFECTION WITH *EIMERIA OXYSPORA*, DOBELL, 1919.

By J. G. Thomson, M.A., M.B., Ch.B.
Director of Protozoology, London School of Tropical Medicine,
and
Andrew Robertson, M.B., Ch.B.
Assistant in Protozoology, London School of Tropical Medicine, Grocers' Research Scholar.

Clinical History.

The patient had suffered from recurrent attacks of diarrhœa since 1918. He had a very heavy infection with *Giardia intestinalis*, numerous free and encysted forms being found in his stools, and it was while studying the flagellate that the oöcysts were more or less accidentally discovered. The fæces had been examined from time to time since 1918, but *Eimeria oxyspora* was found in only one stool. It seems probable that *E. oxyspora* is more frequently present in human stools than the rarity with which it is recognized would indicate, and this is possibly due, firstly, to its low degree of pathogenicity, secondly, to the small number of oöcysts present in the stools, and thirdly, to the transient nature of the infection. In all the infections so far recorded the oöcysts have only been found at the most in two stools from the same patient.

The authors desire to express their warmest thanks to Dr. Broughton Alcock for his kindness in supplying them with the material for this study.

The Original Description of the Oöcysts of E. oxyspora.

The oöcysts of this species of human *Eimeria* were first described by Dobell, 1919, as occurring in the fæces of a young man who had been in South Africa, Ceylon and India, and who had suffered for about seven years from chronic amœbic dysentery. The stools of this patient were examined frequently over a comparatively long period, but the oöcysts were found only on two occasions, and then in very scanty numbers. All the oöcysts were at the stage of complete differentiation.

Dobell described the oöcysts as "spherical, with a diameter of about 36 microns. Its wall is composed of at least two distinct layers—an inner, fairly thick and uniform, and an outer which appears composite, and is incrusted with adherent bacteria and other foreign particles from the fæces." The sporocysts, which measured in length from 30 microns to 32 microns, with a width in the middle of about 7·5 microns, were shaped like whetstones with sharply pointed ends, and contained two long, slender sporozoites, the anterior ends of which were pointed, the posterior blunt and rounded. Towards the posterior end of the sporozoite, "lying subterminally," was an oval body which Dobell thought was probably the nucleus. Between this oval body and the end of the sporozoite were "two or three very bright and small bodies, fusiform in outline and longitudinally disposed." The exact nature of these bodies is not known, but they have a rather crystalline appearance.

The Discovery of E. snijdersi.

Snijders, 1921, working in Sumatra, found very similar oöcysts in the stools of a patient whose fæces had been periodically examined for the cysts of *Entamœba histolytica*. These oöcysts varied in diameter from 40 microns to 48 microns, while the majority were about 45 microns. The sporocysts were described as whetstone-shaped, from 17 microns to 20 microns in length, and 7 microns to 8 microns broad, and, further, while usually sharp-pointed at the ends, they were occasionally more rounded.

With regard to the sporozoites an accurate description was difficult as they could not be made out easily. Apparently they were similar to the sporozoites of *E. oxyspora* in so far as they were "slender, one end being more obtuse than the other," and having these obtuse ends directed towards opposite poles. On the other hand, Snijders was unable to make out the "crystalline" bodies mentioned by Dobell, nor the nuclei.

In connection with the findings in the present case, it is important to note that Snijders said that "sometimes the sporozoites had a 'fixed' coagulated appearance, with some bursts, suggesting necrosis and disintegration of their coagulated bodies. Suspended in a 2 per cent. eosin solution (with 0·9 per cent. NaCl) these forms readily stain red, confirming the fact that these sporozoites were dead already."

Dobell's Communication on E. snijdersi.

Dobell, 1921, examined a preparation sent to him by Snijders, which the latter had attempted to stain with Heidenhain's iron hæmatoxylin and eosin, but found that, owing to there being practically no difference in the refractive indices of the oöcyst walls and the balsam in which they were mounted, it was impossible to make out the oöcysts. Dobell accordingly removed the balsam with xylol, and passed the specimen through the various grades of alcohol until he was finally able to mount the film in water. In this medium he found easily a number of recognizable oöcysts. Many of these were collapsed, but the sporocysts were intact. The pink-stained sporozoites appeared to be very degenerate. Dobell agreed with Snijders that the diameter of the oöcysts varied between 40 microns and 48 microns, but estimated the length of the sporocysts as from 20 microns to 25 microns, explaining the discrepancy between his measurements and those of Snijders by the fact that he was allowing for obliquity. On these observations, and especially the length and shape

of the sporocysts, Dobell created a new species to which he gave the name *Eimeria snijdersi*.

The Second Case of E. oxyspora, Dobell, 1919.

In 1921 Broughton Alcock and Thomson found the oöcysts in the fæces of a lady, who had never left England except for occasional pleasure trips to the Continent. In 1920 she spent two months in Malta. At the time when her stools were examined she was suffering from digestive disturbance, constipation and debility, and had infections with *Trichocephalus dispar* and *Entamœba coli*. No blood, mucus, or pathological exudate was present.

The oöcysts were present only in one stool, and were numerous and not degenerate. They differed from those in Dobell's case by appearing at all stages of development, some having only a single undifferentiated protoplasmic mass, the majority showing four dizoic sporocysts, while others illustrated the intervening stages. The minimum diameter of the oöcysts was 33·6 microns, the maximum 50·6 microns, while the average was about 42·5 microns.

The sporocysts were not so long as those in Dobell's case, the smallest and largest individuals being approximately 25 microns and 30 microns respectively. Their width in the middle was 6 microns to 7 microns. In shape they were of the typical whetstone outline as described by Dobell in his original case with fairly blunt ends.

The sporozoites, which in several specimens were capable of being measured, were about 19 microns to 20 microns in length. They showed towards the posterior ends the "crystalline," fusiform-shaped bodies, and the nuclei were quite distinct, oval or round, vesicular, and placed not quite in the centre of the body, but nearer the posterior end.

Broughton Alcock and Thomson suggested that, since, according to their findings, the dimensions of the oöcysts and sporocysts of *E. oxyspora* are subject to considerable variation, the question might possibly be raised as to whether *E. snijdersi*, Dobell, 1921, is a species distinct from *E. oxyspora*, Dobell, 1919.

The findings in the present case may throw some light on the matter.

The Present Case.

In this case unfortunately only one stool was available for examination, and only a small quantity at that. It was very dark in colour and chiefly fluid, although a few more solid masses were present. Crystals of oxalates and phosphates were abundant, and it is possible that the specimen also contained urine. Cellular elements were very rare, but numerous *G. intestinalis*, both flagellate and encysted forms, were found. Other than the oöcysts of the *Eimeria* no further protozoa were discovered.

The oöcysts were not numerous, and, in view of the fact that by far the greater number were degenerate, careful search had to be made to find specimens which showed clearly all the points necessary for accurate study of the morphology.

In size the oöcysts varied from 36 microns as a minimum to a maximum diameter of 52·5 microns, but the average diameter was between 40 microns and 42 microns. Only one cyst was found with a diameter of over 48 microns (52·5 microns), and it is possible that this, while not abnormal, was larger than the usual in this race. The length of the sporocysts was between 30 microns and 32 microns, and their width at the broadest part 6 microns to 7 microns. The sporozoites, when fully formed, were from 19 microns to 20 microns long. Many of the sporozoites had the fusiform, "crystalline" bodies as described by Dobell and by Broughton Alcock and Thomson towards their posterior ends, but only in one specimen was the nucleus made out near the centre of the body.

The large majority of the oöcysts had their contents shrunken into a mass in the centre, a mass in which, beyond an occasional distorted sporozoite, no definite structure could be made out. The appearance of such oöcysts gave a strong impression that the indeterminate central mass was formed by the contraction of a membrane or pellicle, which normally should have lined the inner surface of the oöcyst wall, but which had squeezed together the sporocysts and their contents. It is significant that these specimens were especially permeable to certain aqueous stains, such as 2 per cent. eosin and also iodine in potassium iodide solution, and that in some even the sporozoites took up the stain, whereas, in oocysts showing no contraction of the lining membrane and the contents of the sporocysts intact, only rarely did the stain penetrate at all. In one of these shrunken masses it was possible to make out the dimensions of a sporocyst, and this was approximately only 20 microns in length.

In all the undamaged oöcysts the contents had undergone complete differentiation, except that in some the sporozoites were more oval, and had not yet developed into the true elongated sausage shape. Those with the contents jumbled together could not be confused with the undifferentiated specimens, as described by Broughton Alcock and Thomson, where a large, granular, protoplasmic mass occupied the centre of the cyst, and it seems probable, from the appearance of such sporozoites as could be made out, that all the cysts were very nearly fully developed.

Comparison of the Oocysts in the Present Case with those of Dobell, Broughton Alcock and Thomson, and Snijders.

The measurements of the four cases can be more easily studied if tabulated as follows:—

	Oöcysts	Sporocysts	Sporozoites
	Microns	Microns	Microns
Dobell	36	30·32	—
Snijders	40-48	20·25	—
Broughton Alcock and Thomson ...	33·6-50·6	25-30	19·20
Present case	36-52·5	30·32	19-20

Dobell, in creating the species *E. snijdersi*, took into account the size of the oöcysts, which were larger in Snijders' case. It has been proved, however, in Broughton Alcock and Thomson's case, that the oöcysts of *E. oxyspora* may vary considerably in diameter, and may even be larger than those of Snijders. The present case emphasizes this point.

The size of the sporocysts in *E. snijdersi* given by Dobell was from 20 microns to 25 microns. In Broughton Alcock and Thomson's case of *E. Oxyspora* they measured from 25 microns to 30 microns. Further, there was a slight difference in the shape of some of the sporocysts in that they were more spindle-like and had sharper pointed ends. Snijders was unable to make out the fusiform, "crystalline" bodies in the sporozoites, but these are by no means constantly visible in every individual.

The diagnosis of *E. snijdersi* from *E. oxyspora* must rest accordingly on the slight difference in size of the sporocysts, and the fact that the ends of the sporocysts in some specimens of *E. snijdersi* show a greater acuity. This seems to be very slender evidence to justify the formation of a new species, especially when the measurements were made on material which had undergone considerable vicissitudes in the course of the attempts at staining.

The oöcysts in the present case were very similar to those described by Snijders, and differed from those in the Broughton Alcock and Thomson case by being much more permeable to stains. In some of the individuals the sporocysts, as a result of the contraction of the contents, were altered in outline and had sharp-pointed ends. Such sporocysts measured as small as 20 microns.

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THE NEW GENUS *ALOFIA* OF THE FAMILY *LINGUATULIDÆ*. AN ANATOMICAL ACCOUNT OF *A. GINÆ*.

By George Giglioli, M.D., D.T.M. & H.

Through the kindness of Dr. Sambon I have been able to study several specimens of a new species of Linguatulid, belonging to the collections in the Museum of Natural History at Innsbruck. This new species I have named *Alofia ginæ*, and was kindly permitted to include a short account of it in Dr. Sambon's "Synopsis of the Family Linguatulidæ," published in The Journal of Tropical Medicine and Hygiene, No. 12, vol. xxv, June 15, 1922. These specimens were collected in Samoa; unfortunately the host has not been recorded.

I desire to give here as complete a description as possible of this parasite, and to define the characters of the new genus, which I have named *Alofia*.

External Morphology.

Mature Female, 20 x 3 mm.—Body fairly cylindroid, and slightly curved ventrally. The anterior end is the smallest, and is slightly acuminated when viewed laterally. The posterior end is extremely blunt and rounded. At its apex the anus is situated, and contiguously and ventrally the genital opening. The transversal diameter of the body is fairly constant from the base of the cephalothorax till about 2 mm. from the posterior extremity. The ventral aspect is very slightly flattened, especially in the anterior third, where it is in direct continuation with the flattened hook-bearing ventral surface of the cephalothorax. It is delimited by two latero-ventral grooves or lines, which originate just behind the posterior hooks, and run throughout the whole body, disappearing only at a distance of about 2 mm. from the anus. The annulation is practically effaced, and scarcely perceptible to the naked eye. It presents more the character of a transversal striation. Under low magnification seventy-five rings on an average can be counted.

The *cephalothorax* is relatively large, and in direct continuation with the abdomen. It is very slightly bent ventrally; flattened anteriorly, convex dorsally; broad when viewed from the front. The ventral surface is limited by a sharp margin; it bears the mouth and hooks. The hooks are situated in a trapezoidal formation, the trapezium being a very low one and its sides highly inclined, owing to the short interval between the anterior and posterior hook-lines and to the marked difference in their respective lengths. The hooks are equal and their blades fang-like, long, smooth, sharp and caniculated, and bent at right angles. They are much larger than in *Sebekia*, and the root in cleared specimens is seen to extend deeply in the cephalothorax. The mouth is a small transversal slit opening at the base of the conspicuous U-shaped chitinous armature delimiting the oral papilla, or upper lip. This structure extends from the posterior hook-line to well up between the anterior hooks.

The sensatory papillæ, usually so marked a feature, are scarcely perceptible, only the terminal pair, situated over and slightly medially to the anterior hooks, being visible.

Immature Female.—The general external morphology coincides with the description given above; the posterior third or half, however, is much slimmer, and the posterior extremity not so blunt and rounded. The annulation can also be more readily appreciated, as the body wall has not yet under-

gone the distension brought about by the development of the uterine coil.

Male.—Length 17 x 2·7 mm. The male is smaller and slighter than the female, though resembling her in general morphology. The maximum diameter is near the caudal extremity, which is rounded and blunt and bears the anus, opening in a small transversal slit. As usual, the genital

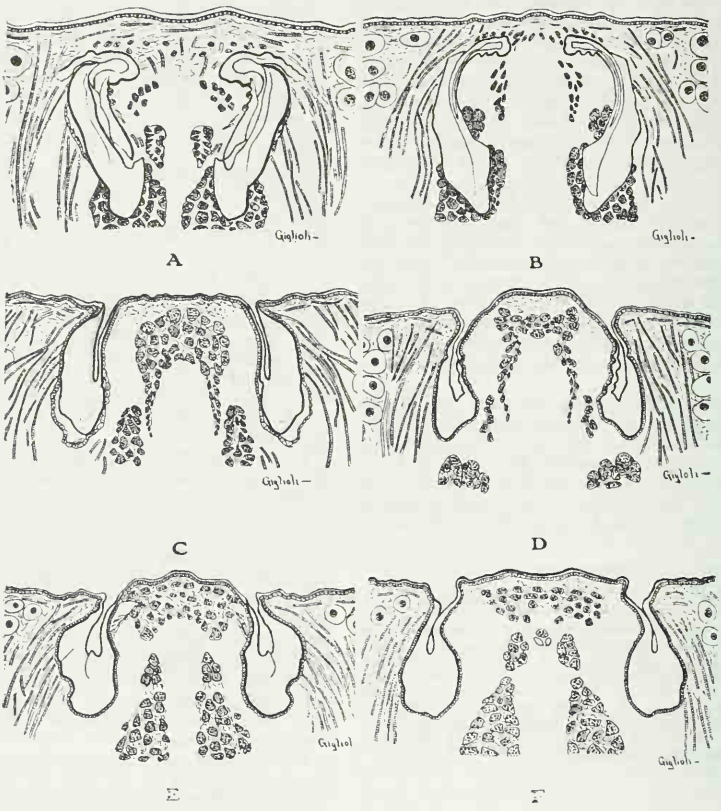


FIG. 1.—Transverse sections through the oral papilla of *Alofia ginæ*, showing the different appearance of the chitinous structure. In sections C, D, E and F (cut through the more distant part of the organ), it appears as a simple cuticular invagination forming a deep groove, with highly chitinized sides. In A and B (cut through the anterior part of the papilla) the groove is transformed in a fine and deeply situated diverticulum, contained in a strong chitinous structure. (Spatular processes—see text.)

openings are situated at the anterior end of the abdomen on the second body ring. They are two small orifices, opening symmetrically in the sides of the mid-ventral line, on a small eminence, each being surmounted by a small papilla.

ANATOMY.

Mature Female.—Body-wall remarkably thin The external stratum is formed by a fine chitinous cuticle; when seen under high magnification, in transversal sections, it presents a stratified structure of fairly uniform thickness. It invaginates to form the hooks and the chitinous mouth-frame. Under the cuticle is the cellular or epithelial layer, formed by a single stratum of small flattened cells. The muscular tunic presents two layers: the outer one being nearly continuous and formed by fine circular fibres. These are branched and anastomosed so as to form a network with meshes directed perpendicularly to the principal body-axis. More deeply situated are the longitudinal fibres, stronger and broader, but much more sparsely disposed, and running parallel to one another.

The ventral wall of each ring is provided with slightly oblique muscular bundles, which are inserted on the internal surface of the lateral body-

wall, in correspondence with the latero-ventral grooves. The body-wall presents two slight thickenings along its dorsal surface, where the mesovarium and the mesentery detach themselves, numerous muscular fibres passing into these structures. The parietal gland cells, described by Leuckart, by Hoyle, and others in *Armillifer armillatus*, and by Spencer in *Waddycephalus teretiusculus*, are far from conspicuous. The disposition of these cells seems to vary greatly from one genus to another. As Leuckart and then Hoyle demonstrated in *A. armillatus*, they are massed to form the parenchymatous tissue filling out the rings which characterize this genus. In *Alofia ginæ* I have found them to be completely absent from the greater part of the body-wall, while they are found in small numbers along the surface corresponding to the latero-ventral grooves.

The *alimentary tube* is divided into several parts: the fore-gut, comprising mouth, pharynx and œsophagus; the mid-gut, and the hind-gut or rectum. The external aspect of the mouth has already been described. The oral opening proper is not visible in the whole specimen. It is surmounted by the oral papilla, which originates high up between the anterior hooks, and extends to the posterior hook line. It is slightly concave, with a roughly rectangular outline. It is delimited by a deep groove, into which the body-wall introflects itself. The cuticle all along this groove, and on its margins, becomes highly chitinized, forming the large U-shaped structure already described. The oral margin of the papilla is smooth and formed by simple cuticle. In cleared specimens this structure is seen to extend deeper and to a greater length than appears on first examination. This is due to the fact that anteriorly the grooves are very deep and have lost their direct communication with the outer surface. In other words, this gives origin to two diverticula, the chitinized sides of which form two large spatulate processes. Many muscular bundles take insertion on this structure, especially on the processes just described. From here the fibres are mainly directed caudally and find their insertion on the cuticle of the free margin of the oral papilla, and principally on the upper surface of the pharynx. Others have an oblique course caudally and ventrally, and take insertion on the cuticle of the ventral surface of the papilla. In conclusion, this organ appears to be capable of two movements: by contraction it draws up and expands the pharynx (suctional action); and at the same time, through the action of its oblique ventral fibres, it retracts its ventral surface, thus rendering still more concave the space limited by the chitinous mouth-rim; in this condition this surface can act as an organ of adhesion or ventose, as Hoyle pointed out for *A. armillatus*. The lower lip presents a thick, chitinous margin. Even the floor, or lower surface of the pharynx, is formed by a strong chitinous organ. This is the tooth-like organ so well described by Spencer for *W. teretiusculus*. This author is of opinion that the perforation of blood-vessels takes place through the scraping action of the papilla against this hard organ, the acuminated anterior extremity of which is adapted for perforation. In transverse sections the pharynx appears as a crescentic organ, the ventral or concave margin of which is chitinized (especially in its medium tract, where the tooth-like organ lies), while the dorsal or convex margin is lined by simple cuticle which lines the epithelial stratum. On the outer surface of the pharynx numerous muscular bundles take insertion, irradiating dorsally, laterally and anteriorly to the body-wall, where they find their fixed insertion. I have already described these bundles, which derive from the chitinous rim of the oral papilla and from its deep spatular processes, and which have a longitudinal course through and slightly dorsally to the papilla, fixing themselves on the roof of the pharynx. Through the synchronous action of these many muscles the pharynx is dilated in all its diameters and acts as a sucking-organ.

The œsophagus is a short, cylindrical tube which follows a slightly arched course dorsally and caudally, and connects the pharynx with the mid-gut. Its limit of origin towards the pharynx is not evident. Its structure is similar to that of the dorsal wall of the pharynx; the epithelium is lined with cuticle. It does not open at the anterior extremity of the mid-gut, but on its ventral surface and a little caudally. Round its orifice the epithelium is thrown into folds, which form a valvular structure similar to that described by Leuckart, Hoyle, Spencer and others in other species. These authors have also described a muscular sphincter round the orifice. The mid-gut is fairly voluminous. In the dissection of one of these tongue-worms it appears to be still more so, and extremely fleshy. This appearance is easily explained in sections, and is due to the remarkable muff-like disposition of the hook-glands, which form a continuous parenchymatous structure embedding the stomach. The length of the mid-gut corresponds to the length of the body; it is therefore straight and generally cylindrical. In one specimen I found it to be slightly sacculate, especially towards its posterior extremity. The columnar epithelium which lines it is thrown into ample folds, so forming a system of longitudinal crests and furrows with a more or less parallel course running from one end of the organ to the other; the absorption surface is therefore greatly increased.

The histological study of the intestinal wall, and of its relation to the surrounding glandular tissue, is of very great interest, and in my opinion throws considerable light on the hitherto enigmatical function of the so-called hook-glands. The intestinal epithelium is columnar in type, formed by large, long cells, with a deeply staining cytoplasm and a large vesicular nucleus, which is placed near the base of the cell, presenting a conspicuous nucleolus. The epithelium is sustained by a deeply staining, thick basal membrane. In a transversal section,

the longitudinal folds which characterize the internal layer of the mid-gut are cut perpendicularly to their axis. They appear as finger-like appendages of variable, but fairly constant length, projecting in the lumen of the gut, and situated at more or less intervals; their number averages nineteen. At the base of each one of these structures the basal membrane regularly presents a marked invagination, forming an acute angle pointing towards the lumen. Under high magnification, in favourable sections, this invagination is found not to be blind, but to continue in one or more fine canals, the principal one of which runs a straight course along the middle part of the projection. Near its apex it expands in a cup-shaped cavity, which appears to open directly into the intestinal lumen. The other canalicula, if present, run an independent course, generally slightly arcuate, so as to open on the sides of the projection. The sides of these tubes present at intervals some

FIG. 2.—Section through the pharynx of *A. ginæ*. Anteriorly the section runs through Spencer's *tooth-like organ*.

small, flattened, elongated cells, which form a non-continuous lining; their base opens into a peri-intestinal cavity, delimited internally by the external surface of the basal membrane of the intestinal epithelium, which only at intervals presents some small flattened cells similar to those which line the canalicula; and externally by a fibrous membrane which envelops the glandular tissue. This external wall of the cavity is lined by a single layer of flat epithelial cells. In the specimens examined this cavity was little more than virtual, and apparently empty. Through the canalicula described it is in direct communication with the lumen of the gut. It thus appears that the longitudinal epithelial columns are pierced all along their course by a very great number of canalicula by means of which the intestinal lumen communicates with the peri-intestinal cavity.

The fibrous membrane, which forms the external wall of this cavity, sustains on its outer surface a very regular stratum of cubical cells. Beyond these the large glandular cells are massed. They are very large elements, with a reticular and granular protoplasm. Rounded or oval in form, oftener polyhedrical through mutual compression, they present a large rounded nucleus with nucleolus. Some of the cells, occupying the innermost layer, present some well-marked protoplasmatic finger-like prolongations, which, passing through the layer of the cubical cells, lose themselves in the deeper part of the fibrous membrane. What these prolongations may be, and where exactly they end, I have not been able to detect, but they seem to form a means of communication between the glandular elements and the peri-intestinal cavity. (I describe the hook-glands with the digestive system, as I believe their function to belong to the alimentary apparatus as organs of elaboration and food reserve.)

The glandular tissue forms a complete and continuous muff-like envelope round the intestine from the posterior end to the base of the cephalothorax. The thickness of this parenchymatous layer is not constant, and even the cells present some notable differences in the successive segments of the organ. In the anterior half the glandular tissue is not only limited round the intestine, but also forms a voluminous body situated ventrally to the gut. The relations between the intestinal epithelium and the glandular tissue are much less evident. The intestinal epithelium is more distended and the longitudinal folds much less evident and regular. The canalicula are visible, but the peri-intestinal cavity, so evident in the posterior segment, is not visible, or only partly visible here, where the glandular cells seem to be in direct contact with the basal membrane. Of the glandular elements, those situated nearest to the intestinal wall present the cytological characters already described. But round the periphery of the glandular mass, situated on the ventral aspect of the gut, some very peculiar structures are visible. They are large, regular ovoid cavities, provided with a regular wall and filled with a deeply staining granular debris, which even under the highest magnification appears amorphous in structure. Often amidst this pulverulent mass a large vesicular nucleus with deeply staining nucleolus can be seen. What the value of these structures may be it is not easy to decide. At first sight they look like parasitic cysts. But the amorphous character of the granules and their enormous number and regular distribution seem to stand against such a possibility. On the whole I think it more likely that they may derive from the breaking up of one or more of the large glandular cells.

The excreting ducts of the hook-glands are only to be seen in the anterior two-thirds of the body; they run a fairly straight course and are two in number. Anteriorly they divide, and in sections carried through the base of the cephalothorax three ducts can be seen on either side. Having been able to section only one specimen, and my series of sections not being complete, I have not been

able to detect the exact location of the orifices of these various ducts; but I think it altogether probable that these do not differ from those of other genera, as described by Leuckart and by Spencer. The two main ducts open at the apex of the primary papillæ surmounting the anterior hooks, while the others open in the enticular fold containing the hooks. There seems to be no relation between these ducts and the fine canal which pierces the blade of the hook, converting it into a true fang.

Among the species they anatomized, Leuckart, Hoyle, Spencer, nor any other author appears to have observed anything similar to these structural

the protoplasmatic prolongation of the deeper layers of the glandular cells, which take contact with the epithelium of the cavity. What this function may be can as yet only be surmised with the greatest reserve. We find that in this species, more than any other, the hook-glands, or digestive glands, as I believe they should more correctly be called, present an enormous development in the immature individual, gradually subsiding in bulk as the parasite approaches maturity, and especially under the great strain produced on the organic metabolism by the development and maturation of the myriads of ova.

I believe that in all probability the elements of

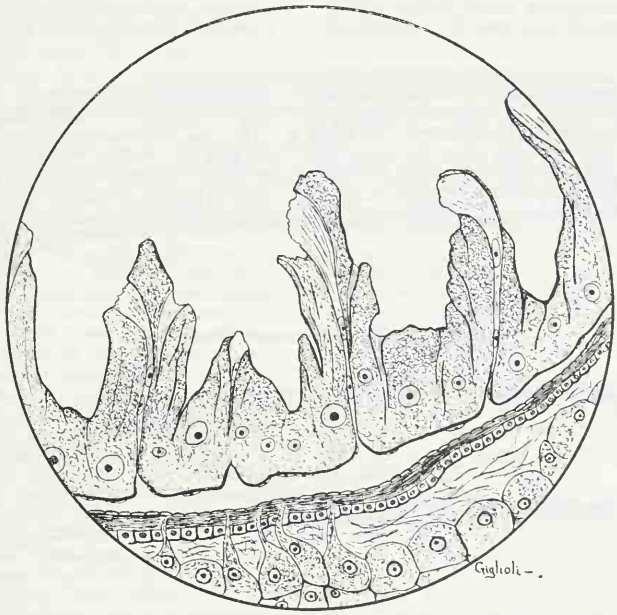


Fig. 3.—The intestinal epithelium of *A. ginæ*, showing canalicula; peri-intestinal cavity and glandular tissue, showing protoplasmatic processes of the glandular elements.

characters of the hook-glands and the intestine and their mutual relation just described. Nor, in the very many species of this family, which through the kindness of Dr. Sambon and Professor Brumpt I have been enabled to dissect and study, have I myself found anything similar. In all other genera, in fact, the hook-glands appear like two more or less voluminous bolster-like organs which accompany the intestine, one on each side.

In *Alofia ginæ* the hook-gland is intimately connected with the alimentary canal, not only anatomically, but also physiologically, through the intestinal canalicula, the peri-intestinal cavity and

the digestive glands are essentially trophic; that they fulfil a function similar to that of the cells of the adipose tissue in vertebrates. The digestive products elaborated in the intestine pass down the canalicula to the peri-intestinal cavity. The nutritive substances are here absorbed through the parietal epithelium by the glandular elements and stored up. In the anterior part of the body I have described some large broken-down elements, in which only the nucleus is recognizable, while the cytoplasm is reduced to a pulverulent, amorphous granular mass. Can these cells be considered as a further stage of functional evolution of the

glandular elements, which break up and give out their reserve substances as the organism requires them? The hook-glands, moreover, are evidently also excretory organs, as their many ducts, opening on the body surface, imply. Through these ducts the waste and noxious products are eliminated. Not improbably these excretory products may subserve some further function, as their orifices in relation to the hook apparatus seem to imply.

Reproductive Organs.

Nothing peculiar to this genus is to be observed. The ovary is fairly thick and reaches nearly to the posterior extremity. As usual, it is dorsal to the intestine, and is fixed to the dorsal wall by a short mesovarium. Anteriorly, just over the spermathecæ it divides, Y-shape, each branch passing on to form the two symmetrical oviducts. As usual, they pass obliquely through the hook-glands, run along the anterior margin of the spermathecæ and, with a marked curve medially and caudally, unite on the mid-ventral line. Just in front of their point of union they are joined by the ducts of the spermathecæ and together form the utero-vagina. The spermathecæ are large and ovoid, or piriform, symmetrically situated, on the ventral side of the body cavity, in the extreme anterior region of the abdomen. They present a very thin, membranous wall and a thicker base or bulb, from which the spermathecal duct takes origin. They are distended by a huge mass of sperma. The spermatozoa, in sections, appear to be disposed in whirls, all the nuclei or heads being situated in the same direction.

The utero-vagina in the adult appears as a very delicate membranous tube, much distended by eggs. It is much longer than the body, so that it fills the body cavity and distends its walls by its numerous coils. The last tract, which does not contain eggs and leads to the genital opening, is much slimmer, and its wall thicker and stronger.

Nervous System.—As in other genera, a large ganglionar mass is situated on the ventral side of the œsophagus, which is embraced by means of a fine dorsal commissure.

Egg.—No special character. Resembling those of *Sebekia*, presents the three tunics.

Immature Female.—Only differs from the adult in the enormous development of the peri-intestinal glandular organ, and for the short, straight utero-vagina, not containing eggs.

Male.—Owing to scarcity of material the anatomy of the male has not been investigated.

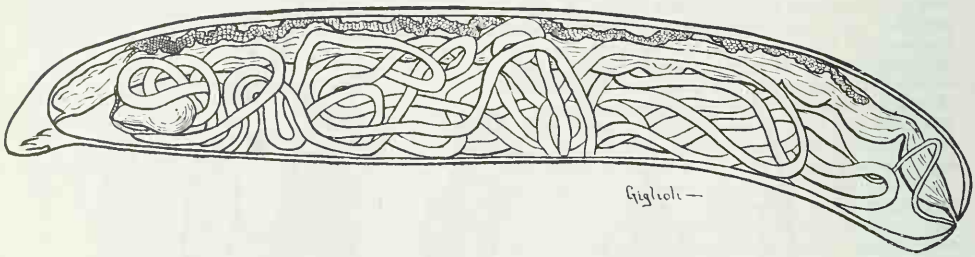


Fig. 4.—*A ginæ*, adult female. Dissection.

Fig. 5.—*A. ginæ*, immature female, showing enormous development of peri-intestinal glandular tissue and straight utero-vagina.

From the foregoing description the characters of the new genus *Alofia* appear evident and striking, and may be briefly recapitulated as follows:—

Body cylindroid, with thick, blunt posterior extremity, where in the mature female the largest transversal diameter is often found.

Cephalothorax, broad

Oral papilla, large, U-shaped, with thick chitinous rim.

Hooks, simple, smooth, large, with very long, fang-like, canaliculated blade. Root extremely long. The hooks are situated in trapezoidal formation, the trapezium being very low and broad owing to the short interval between the hook-lines.

Digestive glands very conspicuous, forming a complete parenchymatous sheath, or muff-like structure, enveloping the intestine. Even the very interesting anatomical connection between these two organs seems to be peculiar to this genus.

The genus *Alofia* seems to pertain to the section *Sebekini*, but its striking anatomical features differentiate it from the other genera *Sebekia*, *Sambonia* and *Leiperia*.

Alofia platicephala.—To this new genus I have ascribed another species of tongue-worm, described by Lohrmann in 1889 under the name of *Pentastomum platicephaliom*, from specimens collected by Natterer in South America together with others of *Sebekia oxicephala*. Lohrmann describes it very incompletely as follows:—

"Body of adult female almost cylindrical, thickest part at posterior end. Head flat, obtuse, slightly more slender than body. Hooks small, and at wide intervals from one another. The somewhat elongate mouth is situated between the anterior pair of hooks. Rings about 70, scarcely visible. Length, 23 mm. Breadth, 2·8 mm. Hook-glands consist exclusively of two gland bodies attached to the intestine. Host unknown, possibly alligator." This description is accompanied by a very rudimental drawing, the general outline of which, however, corresponds to the outline of the cephalothorax of *Alofia*. In 1890 Sir A. Shipley repeated Lohrmann's description and modified the name to *Porocephalus platicephalus*. Again, in 1910, Sambon modified it to *Reighardia platicephalo*. [For an account of these variations of nomenclature, with special reference to the genus *Reighardia*, see Vanni and Sambon, Giglioli and Noc, "Linguatulidæ parasitic in Monitors. The New Genus *Sambonia*," THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE, September 1, 1922.]

Alofia adriatica[1] Hirst, 1922.—Shape of body much the same in both sexes. It is of moderate thickness, the anterior end being narrowed, whilst the posterior is a little enlarged, being the stoutest part of the body. Segmentation not very distinct; there are about seventy-two annulations. There is a distinct lateral line in the female. Chitinous supporting line of mouth shaped almost like a key-hole, whereas in *A. ginæ*, Giglioli, it is U-shaped. Also the distance between the two lines of hooks is much greater in the new species, and the curvature of the hooks themselves is different.

Measurements.—Length of female, 21·85 mm.; width of anterior end (near hooks), 2 mm.; width of middle of body about 3 mm.; width of posterior end about 3½ mm. Length of male, 19 mm.

Locality.—Adriatic; a male and female specimen from the Norman collection; host not given.

From what has been said of the three preceding species belonging to the genus *Alofia*, it appears that unfortunately nothing exact is known as to host which harbours them.

Lohrmann, who found his specimens mixed up with others (*Sebekia oxycephala*) collected by Natterer from the American crocodile and alligator, proposed these as probable hosts. *Alofia ginæ* was collected in Samoa, where no crocodiles exist, and the same objection applies to *A. adriatica*, described by Hirst. The genus seems to have a very wide geographical range which does not coincide with that of any special group of reptiles. Although as yet any opinion on this subject can only be offered as a pure hypothesis, I believe that the probable hosts of this special genus of tongue-worms must be sought among fish.

In Dr. Sambon's "Synopsis of the Family Linguatulidæ" I have provisionally placed in the genus *Alofia* yet another new species, also from Samoa and from an unknown host, a single specimen of which, belonging to the Innsbruck Museum, I have been able to study, and which I have named *A. merki*. Since the date of the publication of that paper I have been able to study this specimen somewhat more minutely, and no longer hold it to belong to the genus *Alofia*, but more probably to the genus *Sebekia*, even though the blades of the hooks are smooth. This opinion is based exclusively on external morphological characters, as the specimen being unique, no anatomical or histological investigation was possible. For the present I propose to maintain this species in the genus *Alofia* while waiting for a more complete study on more ample material in order definitely to decide its taxonomic position.

The length of this specimen is 15 x 3 mm.; rings about 75; scarcely visible owing to high uterine distension. Body fairly cylindrical: posterior extremity thick and bluntly rounded. Cephalothorax small and narrow, as in *Sebekia*. The mouth is almond-shaped, fairly large, extending slightly behind the posterior hook-line, but not reaching to the anterior one; the chitinous armature is strong. The hooks present transitional characters between the two genera; they are very small, as in *Sebekia*, but smooth, sharp and finely canaliculated as in *Alofia*. This species seems to be very nearly related to *S. oxycephala* (Diesing, 1835), Sambon, 1922, which is a parasite of American crocodilia (*Caiman sclerops* and *Crocodilus americanus*).

In fact, I have considered it as a new species mainly on the ground of its geographical distribution and of the probable difference of host, as there are no crocodiles in Samoa. This last consideration stands against the hypothesis that *A. merki* should in reality belong to the genus *Sebekia*, as all the species of this genus hitherto described (*S. wedli*, *S. cesarisi*, *S. divestei*, *S. oxycephala*, see Gilglioli in Sambon, JOURNAL OF TROPICAL MEDICINE AND HYGIENE, No. 12, vol. xxv, June 15, 1922) are parasites of crocodiles, and as already pointed out in other papers, the generic host correlation is one of the most striking features of the Family *Linguatulidæ*.

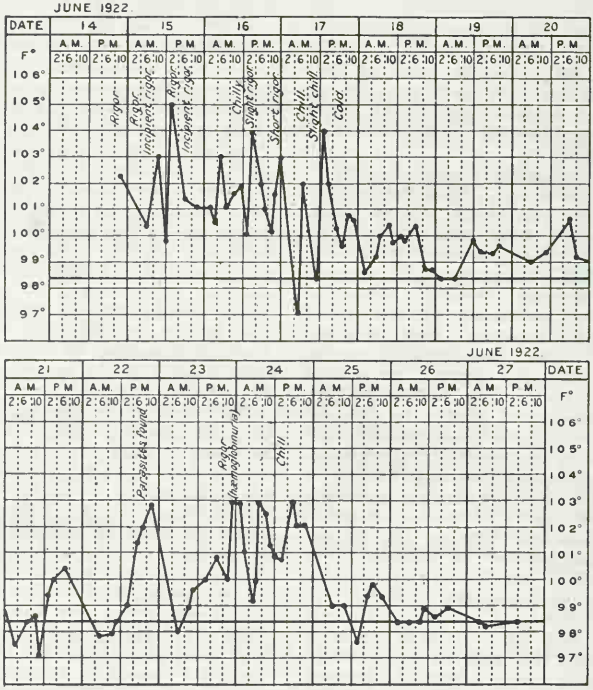
A CASE OF BLACKWATER FEVER COMPLICATED BY RETINAL HÆMORRHAGE.

By R. E. W. Connell, M.D.

The patient, a male European, 26 years old, had had no tropical experience previous to his arrival in Uganda, which was sixteen months before he developed blackwater fever. During this time he had frequent attacks of malaria in an isolated district which were very inadequately treated, and in the intervals he took small amounts of quinine irregularly.

On June 8, 1922, he developed a severe attack of æstivo-autumnal fever, in which the blood showed numerous parasites, often two in one erythrocyte. He was discharged on June 12. On June 14, about 4.30 p.m., he stated he passed some very dark urine, thought little of it, and played one set of tennis afterwards. He then visited, and about 7.30 p.m., feeling chilly and rather wretched, went home. In this respect I am reminded of a former case, when after two days of sharp fever on the morning of the second day of normal temperature, I was called in, and the patient said he felt like getting up, wanted a steak and a pipe, but having just seen his urine recognized that he had blackwater fever; this initiated a very severe attack.

Early on the morning of June 15 the present case reported sick and was found to have blackwater fever. He was a somewhat neurotic subject and not robust. His illness proved to be a severe one with frequent rigors, a good deal of vomiting and retching, and marked weakness. The urine in the initial attack became free from hæmoglobin and albumin on June 20, i.e., six days after the onset. On this date he first complained of a dark spot near the centre of vision of the right eye.



The temperature having subsided to the neighbourhood of 100° F. began to mount again stepwise, and on the 22nd a few subtertian parasites were found for the first time. In my earlier cases of blackwater fever it was noted that two or three days after fever had disappeared a temperature again developed, and malarial parasites were invariably found at this time. Subsequently in a short series of cases immediately on the disappearance of hæmoglobinuria small doses of quinine were administered and gradually increased. Under this system I have not seen malaria develop during convalescence. In the present case the patient claimed

some intolerance to and was in some fear of quinine. I therefore hesitated to exhibit it until parasites were detected. On the evening of June 22 he had 5 gr. of euquinine, and on the 23rd he had 5 gr. of quinine at 7.30 a.m., at noon, and at 8.30 p.m. At 10.30 p.m. he had a rigor, and passed off with difficulty about 1 oz. of thick port wine urine. This ushered in a relapse lasting fifteen hours. It seems difficult to disconnect the quinine element from this.

Throughout the illness when the hæmoglobinuric urine showed a deposit on standing and albumin on boiling, he found it difficult to void and insisted on being partly propped up.

On the 27th the temperature was absolutely normal for the first time and convalescence definitely set in.

In spite of frequent vomiting and retching he was able throughout the illness to retain a satisfactory amount of fluid given in small quantities as often as he could take it. On three occasions, however, recourse was had to rectal saline enemata. He voided an average of over 40 oz. of urine daily. The bowels needed regulating. Treatment generally was symptomatic, though for the first two days an effort was made to give sodium bicarbonate in moderate doses and perchloride of mercury in small quantities, both of which aroused the antipathy of the patient. Tr. camph. co., though used only in doses in the neighbourhood of 20 minims, was found to be particularly useful in allaying or increasing the intervals between attacks of vomiting and also in inducing sleep. On the evening of June 24, when in a very weak state, he was given ¼ gr. morphine sulphate hypodermically (also a small amount of strychnine and digitalin), following which with some short intervals he slept for twenty hours and derived incalculable benefit from it.

There are a few other features worthy of note before describing the eye symptoms. On the 22nd he first complained that the heart missed a beat at rather frequent intervals, and the following one being very full caused a feeling as if the head would burst. By the 24th the intervals were much greater, and on the 25th this symptom disappeared.

On the 24th at a critical time the house was struck by lightning.

From July 2 to 4 there was intermittently a feeling of formication.

The ocular symptoms began on June 20, when in the morning he complained that there was a dark spot in the centre of the eye, which at 8 ft. distance was found to cover a roughly circular area 6 in. in diameter. June 21: The scotoma caused the patient to worry a lot, but his condition did not admit of proper examination. June 22: He reported that the scotoma was larger but not so dense; at 4 ft. distance it enclosed a rough circle 5 in. in diameter; by staring fixedly he could see through it. Later in the day the eye was hastily examined under atropine and a paracentral hæmorrhage detected, but not accurately defined. June 26: He stated that the eye spot was again a little larger and not so dense. He also complained of flashes of light, mists and spots, and indistinct vision in the left eye, which was normally weak, short-sighted and astigmatic. There was photophobia in both eyes. June 27: The eyes felt worse, both having light flashes; he described their condition as being much like that of snow blindness from which he had suffered. He could see better by artificial light. Atropine was instilled for examination, but this he afterwards refused. June 29: The eyes could stand light better as the patient regained strength. July 1: The dark spot receded from the centre of vision, leaving a little dimness. July 3: At 3 ft. the right eye read headings in a newspaper, but he saw a bar above the centre of vision which at the same distance appeared to be 3 in. long by 1 in. deep in the centre, semi-transparent, and changing shape slightly when the eye was fixed. The left eye was very little different from normal. July 5: The denseness of the scotoma had again diminished so that he could see through, and he could also define it as a rough triangle base down above the centre of vision. The base at 15 ft. was 15 in. long and the altitude 9 in. There was still some dimness of central vision, but he could tell there was ordinary print on a page at 6 ft. distance. With the left eye no spots were seen, and he said it was only a little weaker than usual. July 12: Right eye under atropine; the optic disc was probably normal, though the forking of one artery at its periphery was thick and dark. Just below the papilla was a hæmorrhagic △ area the shape of an incomplete triangle about 1·5 mm. deep and 2 mm. long (measurement based on size of optic disc) and base to the centre of the retina. It was still quite dark red. July 14: The hæmorrhagic area in the right eye seemed to be a little lighter. The fundus of the left eye showed no gross lesion. August 20: Both eyes were still weak and spots were seen at times, one of which in each eye, paracentrally placed, was somewhat persistent. I could not detect the hæmorrhage in the right eye.

The Influence of the Thyroid upon Diabetes (Frederick M. Allen, *Journal of Metabolic Research*, vol. i, No. 5, May, 1922).—Thyroid excess may aggravate the symptoms of an existing diabetes, but has never been demonstrated as contributing to the actual causation of diabetes.

Thyroid deficiency may partially or wholly suppress diabetic glycosuria and hyperglycæmia, but this effect is rationally explained as the result of injury or cachexia. There is no indication that the intrinsic severity of the diabetes is lessened or that one deficiency can neutralize another.

Neither the excess nor the deficiency experiments can properly be interpreted in favour of an antagonism between the pancreas and the thyroid or of a thyroid element in diabetes.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 1, 1922.

CIRCUMCISION AS A CONTRA-INCENTIVE TO CRIME.

By F. G. CAWSTON, M.D.Cantab.

IT is being recognized that there is often a sexual cause at the back of much crime, and there is little doubt that some early sexual experiences tend to dislocate a youth's ideas in regard to law and order. Some time ago I was speaking to Dr. B. M. Thomson, the late Medical Inspector of Schools in Natal, about a lad who appeared unmanageable and imbued with a desire to be destructive of property, and he suggested a sexual cause. On inquiry I found this lad had attempted sexual intercourse at the age of 11. More recently I have had this impression confirmed in a lad who contracted gonorrhœa at the age of 15.

I do not think that the value of circumcision as a contra-incentive to crime has been sufficiently recognized. Viewed as a God-given covenant it has proved itself to be a valuable religious asset for many centuries, and, where performed shortly after birth, has safeguarded many a lad who needed only a sexual impulse to precipitate him into a life of indiscriminate crime.

During the last few months I have encountered three cases of venereal disease amongst lads of 15 and 16, where the need for circumcision had been grossly overlooked by the parents or guardians, and it is unlikely that such lads would submit to circumcision once they had become so irresponsive to parental control.

I am well aware that, when practised as it is amongst the natives of the Transkei at the age of 16 to 18 years of age, the rite is associated with unbridled lust and wrongdoing. I recognize that, once habits have formed, the act of circumcision of itself is not a cure of the mental, moral and social state; but I do not believe that the Christian Church has justified itself in excluding this religious rite without giving us in its place something to safeguard the child with immoral inclinations, to whom unaided spiritual advice will help but little. As a corrective, circumcision has been recommended without the use of an anæsthetic, and, in view of the extent to which this rite is performed by others, the medical profession might well reconsider its attitude towards circumcision at all ages, and possibly as a routine, avoiding the use of general if not of local anæsthetics. It certainly seems a little strange that so many stitches are usually inserted when the operation is commonly performed without the use of any.

As circumcision is recognized as a useful aid in clearing up a slight urethral discharge following gonorrhœa, the question arises whether it would not be desirable to make notifiable to the local health authorities all cases of venereal disease occurring amongst juveniles. They are generally recognized as only partially responsible for their actions, and amongst them venereal disease occurs innocently more commonly than it does amongst adults. In this way we could be sure that they would receive early competent medical attention, and, where considered desirable, circumcision could be performed in due course.

Without wishing to go too far afield in this large subject of the prevention of venereal disease amongst adolescents, I may be permitted to add that, in a country like this (Natal), where it is

not generally recognized that every juvenile is supposed to have a guardian, young people need a home, and they should endeavour to make one for themselves as soon as possible after leaving the one in which they have been brought up.

[Dr Cawston's article will command attention to a subject which is apt to be neglected and disregarded, yet the evils are many.]

CIRCUMCISION.

An article on this subject by F. G. Cawston, M.D.Cantab., of Durban, Natal, under the heading of "Circumcision as a Contra-incentive to Crime" we publish with satisfaction. Every medical man, especially those who practise in warm climates, has formed an opinion concerning the subject Dr. Cawston deals with. Are we right in saying that every medical man agrees with circumcision? If it has drawbacks in regard to its principles, or if one has any remarks to make as to any local permanent defects the operation is liable to be followed by, it would be well to draw attention to them, now that Dr. Cawston has wisely opened the subject. Has anything but good resulted from circumcision?

Early circumcision is recommended by the laws of Moses. This recommendation is a wise hygienic step in every climate, for amongst young children, infants even, in Britain phimosis is common, causing much irritation, inflammation, swelling and discharge locally. The young nurse or mother keeps the trouble hidden from the father, and it may be from the doctor, and for a time there is loss of sleep, restlessness, gastro-intestinal and urinary troubles—"wetting of the bed" being one annoying form. The cause of this frequent ailment in children may be congenital narrowing of the preputial exit; or the nurse, often a sister or a very young girl, excites the parts by playful manipulation of the penis.

Erections in children of a few days and of a few months old are frequently met with, due not infrequently to the penis being manipulated by other children in order to watch the effects. In hot climates the genital organs are usually exposed, and the phenomenon of erection by manipulation constitutes an attractive form of pastime. Dr. Cawston's account of the youthful years at which venereal disease is met with in Natal has its counterpart in Europe. In country districts where the bull visits the cow the children are familiar with the operation, and it is a common thing for a young girl of 8 or 10 to be sent with the cow to the neighbouring farm, and whilst the bull is covering the cow the child as often as not has to hold the cow by its halter. The girl will induce her brother or other boys to play at "bull and cow," and so the evil spreads until boys of 5 or 6 years of age enjoy "the game." The cry to educate the scholars at our schools in things sexual, in country districts at any rate, is not necessary; the scholars know more than their well-brought-up schoolmistress, born and brought up in towns; for in towns the "ways of nature" of horses, cattle, pigs, fowls, dogs, &c., are not in daily view. Many advocate the teaching in a theoretical fashion, little knowing that early lessons of the dangers arising from such matters are well known to their audience.

In old men the presence of a long prepuce is often a real danger. With advancing years owing to falling away of sexual desire the penis itself decreases in size, but the prepuce does not grow smaller, and each time urine is passed the loose prepuce is distended and filled out bladder fashion. Some urine remains behind, and in course of time from uncleanliness the parts become thicker, the orifice in prepuce smaller, or a sinuous passageway of several inches leads to slow and imperfect urination; the catarrh which ensues locally leads to discharge of a purulent type, which also soaks the orifice of the urethra itself, causing urethritis, prostatitis, cystitis, and all the urinary phenomena "natural to old men." This is not natural, but a condition due to neglect; neglect it may be, from shamefacedness on the part of the patient himself; but all too frequently because the doctor forgets to examine the penis or takes no special notice of the presence of "an old man's prepuce." Dr. Cawston's warning against so many stitches being used is good teaching. The writer had to lay open a thick and bulging prepuce lately in a man of 91 years of age, when no stitches were inserted, but the inconvenience, the discharge, the temperature of the body which accompanied the ailment subsided after an incision, and the man was comfortable immediately, and continues to be so with a prepuce which healed in a becoming manner.

J. C.

A RECENTLY INTRODUCED PESSARY.

Mrs. Wallace, whom I have known since her childhood, brought me a short time ago a suggestion which for its ingenuity and promise of success attracted my attention. Gradually the suggestion acquired shape. I personally took the instrument to gynæcologist friends, who at once were caught by its possibilities, and consented to give the instrument a trial.

The instrument was introduced for the purpose of relieving sufferers from prolapse of the womb in whom all attempts up to date had failed. In patients from the tropics prolapsus uteri is a frequent ailment, and in hot climates especially is ever a cause of depression, irritation, pelvic ache, and of urinary and rectal disturbance which not infrequently compel the patient to leave the East and "go home."

I have invited Mrs. Wallace to my house to treat several ladies from the tropics who were sufferers from prolapsed uterus.

In all, some almost at once, and others after

adjustment and explanation of the method of applying the pessary, were relieved and benefited to the extent, as one lady said, of making life worth living.

As I do not practise in cases of women's ailments since 1896 when I left Hong-Kong, I have advised those who come for advice whom to see about their malady. I always recommend Mrs. Wallace's pessary, or "Prolapsuport," as it is now named, and request that it be tried.

Messrs. Allen and Hanbury I advised to take up the Prolapsuport, saying I could vouch for the good it does, for the ease with which the instrument is applied and removed, having the great advantage of being removable at bedtime, and can be as readily re-applied by the patient herself in the morning. I see several of the doctors who use the Prolapsuport in their practice give recommenda-

FIG. 1.—Contracted.

FIG. 2.—Expanded

tions, but for professional reasons do not sign their names; but as I am not engaged in gynæcological practice, I have no hesitation in helping a staunch friend in her advancing years in her necessity. Mrs. Wallace is a daughter-of-the-Manse and hails from Aberdeen. All her brothers and sisters are gifted in various branches of science and art beyond their neighbours.

JAMES CANTLIE.

Annotations.

The Anatomical Changes which accompany Healing of Experimental Rat Rickets under the Influence of Cod-liver Oil or its Active Derivatives (Alwin M. Pappenheimer, *Journal of Experimental Medicine*, vol. xxxvi, No. 3, September, 1922).—Rats which had developed rickets were treated with cod-liver oil or an active fraction of cod-liver oil, and the various changes which occur in the healing of the bone lesions were studied. Several phases are described, from the early deposit of calcium salts in the zone of preparatory calcification to the return to normal bone.

These stages correspond closely to those found in the healing of human rickets.

Some Wood-stained Fungi (B. D. MacCallum, M.A., *Transactions of the British Mycological Society*, vol. vii, part 4, July, 1922).—As the result of his investigations, the author is of the opinion that *Graphium penicillioides* Corda must be considered a stage in the life-history of *Ceratostomella Piceæ*. This is the opinion held by Münch.

The Source of the Micro-organisms in the Lungs of Normal Animals (F. S. Jones, *Journal of Experimental Medicine*, vol. xxxvi, No. 3, September, 1922).—It has been possible to show that the lungs of such animals as the calf, rabbit, guinea-pig, white rat and white mouse are readily invaded by organisms. The most frequent types observed in cultures from the border of the lungs have been streptothrix, moulds and bacteria of the *Bacillus subtilis* group. These forms originate in certain dry foodstuffs (hay and straw). By withholding or moistening these materials it has been possible to diminish the number of organisms in the lungs. When these materials have been supplied to mice whose lungs under usual conditions contain only a few organisms, the number of positive cultures increases and is comparable with those of the larger animals. The bronchial lymph glands of all guinea-pigs examined developed, in 66⅔ per cent. of the tubes, organisms similar to those obtained from the lungs.

Slugs as Mycophagists (A. H. R. Buller, *Transactions of the British Mycological Society*, vol. vii, part 4, July, 1922).—The successful experiments with *Phallus impudicus*, *Russula heterophylla* and *R. nigricans* clearly show that the fruit-bodies of these fungi, under certain conditions in the open, attract *Limax maximus* from a distance of at least 10 to 21 ft.

Having regard to the well-known short-sightedness of slugs, to the fact that slugs find their food at night, and to the sensitiveness of *Limax maximus* to mustard gas when diluted to one part in ten million, observations and experiment suggest that fungus-eating slugs react at a distance to the odours given off by fleshy fungi, and that in woods and gardens they find the fungi upon which they feed by their sense of smell.

The chemotaxis of slugs, not merely for fungi but also for the garden produce, such as lettuce and cabbage, is a subject concerning which information is very meagre still, but which is very amenable to experimental treatment. If the

chemotaxis of slugs were sufficiently elucidated, it might be possible to devise much more efficient means for protecting gardens from the ravages of slugs than any at present known.

The Principal Diseases prevalent in the Russian Army (Central Group of the Front) during the Period 1914-1916 *and the Struggle against Infectious Diseases* (Professor Constantino Krzyszkowsky, *Journal of the Royal Army Medical Corps*, vol. xxxix, No. 3, September, 1922).—This article forms the conclusion of one on this subject which appeared in a previous number. An account is given of the various diseases which broke out during this period, and of the means of treatment and of prevention of further epidemic.

The following figures show the maximum and minimum number of cases in respect of each of these more important diseases. The number is calculated per thousand of the total strength.

	Minimum	Maximum
Cholera	0 (1916) ...	... 16 (1915)
Dysentery ...	0 (1916) ...	... 65 (1916) July
Enteritis ...	10 (1916) Jan. to Apr. ...	90 (1915) Jan.
Typhoid fever ...	2 (1916) May-June ...	23 (1914-15) Dec.
Typhus	0·5 (1914) ...	... 4 (1916) Feb.
Relapsing fever ...	0 (1914) ...	... 26 (1916) Feb.
Scurvy	0 (1914) ...	... 80 (1916) July

A glance at these figures shows that the highest percentage of sickness occurred in 1916. Evidently physical lassitude had weakened the organic resistance of the troops, rendering them liable to catch the different diseases. The figures compare favourably with those of the cases of sickness in the British and French Armies, and all honour is due to the Russian medical officers, in that they acquitted themselves no less honourably than their colleagues in the West, in spite of the fact that the means at their disposal were infinitely more restricted and that their work had to be carried out under far more unfavourable conditions.

An Epidemiological Study of Rhinitis (Coryza) in Calves, with Special Reference to Pneumonia (F. S. Jones and Ralph B. Little, *Journal of Experimental Medicine*, vol. xxxvi, No. 3, September 1, 1922).—The following is the summary of this interesting article: During the month of November there occurred an outbreak of pneumonia among the calves of a large dairy. Thirty-two calves in one barn were exposed to the disease. Ten clinical cases developed. Two died of diffuse pneumonia. From these bovisepticus Group 1 organisms were obtained at autopsy. Four affected with pneumonia and eight other calves which failed to show symptoms of pneumonia developed a purulent rhinitis. From the nasal exudate of these cases Group 1 organisms were cultivated. The characteristic rhinitis was reproduced experimentally by brushing the nasal mucosa with a swab dipped in culture. Certain of the calves which suffered from the spontaneous rhinitis continued to carry the organisms in the nasal passages for periods as long as 121 days.

After the first outbreak had subsided practically all calves introduced into this barn developed a milder type of rhinitis associated with organisms of Group 2 bovisepticus. 25 per cent. of such calves continued to carry the organism on the nasal mucosa for periods of fifty to seventy-three days. It was possible to induce nasal infection in calves with pure cultures of this organism.

The Treatment of Epilepsy by Luminal (Dr. B. Conos, *La Grèce Médicale*, Year 28, No. 7-8, July-August, 1922).—It is now three years since the author first prescribed luminal as treatment of epilepsy, very timidly at first, in order to obtain some real idea of its efficacy. When the first trials proved to be encouraging he decided to employ this new medicine systematically, as it seemed to promise more hopefully than any other treatment which had ever been tried before.

A large number of cases were treated by luminal, and some brief observations are given on a number of these. From these observations one sees clearly that luminal treatment is admirable in cases of convulsions, even in cases which have resisted any other treatment, though this treatment had been carried out intensively and for a very long time. It is thus an established fact that luminal lessens considerably the number of attacks, and in some cases it stops them completely.

The question is then bound to arise: Has luminal a symptomatic effect only, or has it in the end a curative action? Granted that epilepsy is a most tenacious and essentially chronic illness, one cannot give a final judgment on the curative efficacy of luminal, as this treatment has not been employed for a sufficiently long time for any definite opinion to have been absolutely proved. The majority of authors favour the theory that luminal stops the attacks, but that it acts only symptomatically, and that the attacks are repeated as frequently and with as great intensity as before as soon as the treatment by luminal is suspended. Some even call attention to the very grave dangers attaching to the sudden suppression of luminal treatment and cases have been instanced when the patient died during the first recurring attack of epilepsy after the luminal treatment had been stopped in a sudden manner. The author goes on to give his own observations from this point of view, and comes to the conclusion that the danger in the sudden suppression of luminal, if not altogether illusory, is at any rate extraordinarily exaggerated. One cannot, however, yet say that luminal can absolutely cure epilepsy, but the experiments which have been made up till now are certainly very encouraging.

The author then goes on to discuss the dose which may be prescribed. This must vary according to the age of the patient and the intensity of the malady.

Luminal, like all other medicines, has its drawbacks. The chief complications which arise through its use are the following: Transitory œdema, urti-

caria, albuminuria, giddiness and excitement. One also finds instances, under this treatment, of physical and mental depression, amnesia and acneform pustules. One is, however, absolutely right in attributing a great deal of this depression to very strong doses being given, and, as soon as the dose is lessened, the depression disappears.

In comparing the treatment with different drugs, the author testifies to the efficacy of bromural in several of his cases, and would by no means advise its being abandoned, even though in general it is very inferior to luminal. It is to the latter, however, that the principal place in the treatment of epilepsy must be given.

Hookworm Index and Mass Treatment (S. T. Darling, *American Journal of Tropical Medicine*, No. 5, September, 1922).—It is the anthor's opinion that in hookworm control it is essential to treat by vermicide all the people in a community within as short a time as possible in order to terminate as far as possible soil pollution and soil infestation. Mass treatment, therefore, is recommended wherever it is practicable, as it is believed that when a whole community is purified within a few days very few hookworm embryos will be passed to infest the soil, and the latter will only become lightly infested and only harmless infections will result.

Carbon Tetrachloride in Hookworm Disease (G. Hampton, *American Journal of Tropical Medicine*, No. 5, September, 1922).—The author is of the opinion that 1·5 c.c. of oil of chenopodium gives microscopic cures in from 30 to 50 per cent. of patients treated, and that a 3 c.c. dose of carbon tetrachloride gives microscopic cures in 90 per cent. of patients, and only costs one-tenth as much as chenopodium.

Abstracts and Reprints.

SANITATION IN THE TROPICS.[1]

By Professor W. J. Simpson, C.M.G., M.D., F.R.C.P., D.P.H.

Asked to write an article on the "Importance of Sanitation in the Tropics," I accede willingly to the request. There are several reasons why sanitation in the tropics should engage attention at the present time. The trouble in the Near East, with its many refugees, is likely to accentuate and impart virulence to epidemic diseases that have for some time been smouldering in that region. The war has disturbed the sanitary organizations, imperfect as they were to protect the larger coast towns. The removal of conditions favourable to the spread of epidemics and the maintenance of endemic disease has fallen into arrears. The danger is accordingly greater than it was in pre-war days, when sanitation was more or less to the fore, and its value was beginning to be appreciated by administrators as well as by sanitarians. Not that our tropical possessions were then safe from destructive epidemics. As a matter of fact, they were not. The organization for the prevention of disease was only in an embryonic state as compared with what was needed. To promote the emergence from this early stage of development of sanitation to full maturity is important for the welfare of our tropical possessions. It is also important for Great Britain. Few realize, at a time of economic distress and paralysis of continental trade, the vastness and potential riches awaiting development in our tropical lands. These will grow nearly everything, and what they cannot supply in food and raw material, Australia, Canada and South Africa can. They are awaiting the enterprise of the British people; but there is one proviso, and it is that the open sesame to these riches is to make the people healthy and contented, and save them from the ravages of malaria, small-pox, dysentery, typhus fever, cerebrospinal meningitis, sleeping sickness, filariasis and other preventable diseases which in the locality in which these diseases happen to prevail seriously affect the health, vigour and productive power of the inhabitants. It is only by this means that the tropics will flourish under the white man.

One of the great difficulties in preventive medicine has always been to convince administrators that most of the communicable diseases are preventable, and are due to removable causes, and that prevention is a paying concern. Ninety years ago it required the stimulus of an epidemic of cholera, with over 40,000 deaths, partially to awaken the authorities and the public in England to a sense of the danger attaching to the deplorable insanitary conditions under which the inhabitants lived, and the necessity of introducing administrative and sanitary measures for the removal of these conditions brought to light after the epidemic by the several commissions of inquiry. But it was not until the alarm created by the approaching invasion of another epidemic of cholera in 1848, which caused some 54,000 deaths, that the recommendations began to be carried out with enthusiasm and some expedition. Even after the alarming experience of this second epidemic, the town of Worcester refused, on the plea of expense, to appoint a medical officer of health under the first Public Health Act, which was permissive.

It was the same with the Army: it needed the scandal of one-third of the Army being disabled in the early part of the Crimean War for it to be realized that sanitary measures must be taken both at home and abroad to secure a healthy army.

Once the lesson was learnt and the advantages appreciated the advance in sanitation and its administration was remarkable.

[1] Abstracted from the *West India Committee Circular*, October 26, 1922.

There is now an urban and rural sanitary service supervised by a county and central sanitary service. Malaria, dysentery, small-pox, typhus fever, typhoid fever and scurvy, which were endemic in England in pre-sanitation days, have practically been abolished.

The attention paid to sanitary reform in England was not without its influence in her tropical possessions. The first to follow was India, but on a tentative scale, that could only benefit a very limited portion of its population. It was sufficient to demonstrate that wherever the principles of hygiene are continuously applied, whether in the tropics or in a temperate zone, provided they are adapted to the customs of the people the same successful results are obtained. The effect of sanitary measures and a better selection of sites for military stations, cantonments and jails reduced the annual death-rate of the British soldiers in India from 80 to 1,000 per annum to less than 5 per 1,000 in recent times. The death-rate of Indian soldiers has also fallen to a similar extent, while that of the Indian prisoner has been brought down to 12 per 1,000 annually.

In the few towns where a health officer was appointed, with a trained sanitary staff, the health of the civil population has improved. In the olden days the Europeans in Calcutta who lived through the rains used to meet and congratulate each other on their good fortune of not having joined the majority. Nowadays the European is about as healthy as the man at home. But, as stated previously, the sanitary service in India was limited in its scope, and quite unable to deal with epidemics in that vast country. It could not save India from the plague which was imported in 1896, and has since caused some 12 million deaths—and is still there. Two years before the plague arrived attention was drawn to the defenceless state of the country and the need of an efficient sanitary service, but such a service as that recommended is only now in the process of completion. If we turn from India to the West Indies we find that in the early days of the English occupation the mortality among European soldiers was greater than in the East Indies. Fever, scorbutic dysentery and phthisis were extraordinarily prevalent, and it was estimated that the life of a regiment was about five years. Later, in twenty years, from 1817 to 1836, the mortality in Jamaica was 121 per 1,000 annually, in Trinidad 106, in Barbados 55, in St. Lucia 122. The mortality occurred under the following conditions. The food of the soldier consisted mainly of salted meat with but scanty supply of vegetables. The drinking water was taken from polluted sources, the barracks, built on unhealthy sites, were badly constructed, without ventilation and were overcrowded, the cubic space for each man being about 200 ft. The sanitary arrangements were foul and neglected and of the most primitive character. Over-eating, intemperance in drink, unsuitable clothing and no exercise added also their quota of unhealthiness. As the conditions mentioned were improved a steady decline in the death-rate took place, falling more than ten times below the former rates.

The discoveries of Manson and Ross and of others in the later years of the 19th century and the establishment of the London and Liverpool Schools of Tropical Medicine, with the large number of medical men trained in these schools and sent to the tropics, created a new spirit in our widely scattered tropical possessions. The special training they received in the treatment of tropical diseases did not exclude attention to prevention. Medical officers, on going to the tropics, began to take stock of the causes and conditions giving rise to these diseases, and favouring their endemicity and spread. As a result health officers have been appointed to some of the larger towns, and in a few local Governments is to be discerned the nucleus of a central sanitary service stimulated by the Medical and Sanitary Advisory Board at the Colonial Office. The result is that marked improvement in health has been effected by anti-malarial measures in Hong-Kong, the Malay States, and in some of the coast towns in West Africa. But, according the highest credit to these pioneers for their work, no one familiar with the tropics and the insanitary conditions existing everywhere among the native population can be satisfied that this is enough to ensure safety against either epidemics or endemics. Like India, most of the localities are defenceless against the spread of epidemic diseases. Moreover, until these insanitary conditions are removed, very little impression will be made on the malaria, hookworm disease, filariasis, dysentery and other diseases that may be endemic in the area. It is the common endemic diseases that do a vast amount of harm to the community, causing a high mortality, much sickness and debility. Epidemic outbreaks only occur at intervals, but when they do appear, and there is no properly organized sanitary service to combat them at once and dependence has to be relied on measures hastily supervised to counteract and lessen its ravages, it is seldom with success. But even with success it is not prevention.

There is even to-day a reluctance to spend money on an efficient sanitary organization and on sanitary measures in the tropics. A common plea is, there are no funds to remove insanitary conditions. Even when an attempt is made in the right direction sanitation generally receives only the crumbs from the Budget-loaf after every other administrative project receives its share of bread. A properly trained sanitary service with a thoroughly capable, experienced and well-informed Sanitary Commissioner at its head is a cheap and sound investment. It is not so if the head is inexperienced in the practice of preventive medicine. The sanitary service, under these circumstances, is liable to become expensive.

The mixing up also of that which belongs to

curative medicine with preventive medicine is an obstacle to the advancement, and full benefit, of the latter.

The prevention of disease is a financial gain. Each life has a potential value which reaches the maximum at the productive age. From this aspect the mortality and sickness caused by either endemic or epidemic disease mean a monetary loss to the community and to the individual. To combat an epidemic there is the large expenditure which has to be paid by the community on measures for the suppression of the disease. Extra staffs, hospitals, nurses, medicine and other requisite material soon swallow up large sums of money. There is also the financial loss due to death and sickness, and there are the commercial and trade losses due to quarantine and restrictive regulations on transit of goods and merchandise. If these items of cost, direct and indirect, were dealt with in medical reports on each epidemic the total amount would surprise most people. It was estimated that Bombay lost £100,000 a week when plague broke out in that town in 1896.

Some fifty years ago an eminent and exceptionally experienced British sanitarian declared, as a result of careful work and observation, that "It has been proved over and over again that nothing is so costly in all ways as disease, and that nothing is so remunerative as the outlay which augments health and in doing so augments the amount and value of the work done."

It is not easy to get this well-established fact recognized. The Americans have realized it more quickly than those responsible for the welfare of the native population in our tropical possessions. Once it is grasped there will be hope of more rapid progress than at present obtains.

The modern American view based on experience is that prevention of disease in a community is a commercial asset—and that an organization for that purpose is a paying concern. They were convinced by Gorgas's success in abolishing yellow fever from Havana and introducing sanitary measures which converted that extraordinarily unhealthy city into one of the healthiest in the world. Havana is no longer avoided as a place of pestilence. That conviction was still further strengthened by Gorgas's triumph in the Panama Canal Zone, where he conquered yellow fever and malaria, and reduced the death-rate amongst canal employees from 40 per 1,000 per annum in 1904 to 7·5 per 1,000 later; and by this means gave opportunity for the engineering works to be carried out by Goethal under healthy conditions. Although Gorgas was given a free hand by President Roosevelt, he accomplished his great task economically, and there was no extravagant expenditure. The cost did not exceed 1 per cent. of the capital outlay.

In contrast to this achievement was the failure of the former attempt—not on account of engineering difficulties, but owing to financial collapse, caused by the enormous expenditure on supervision and labour entailed by sickness and death, as well as the alarm created by the great loss of life. The French lost over 22,000 labourers in five years; 1,000 negroes imported from the West Indies died within six months, and 1,000 Chinamen lost their lives in the same period.

To these striking examples of the power of properly directed preventive measures may be added some of the experiences of the effect of tropical sanitation work in the Southern States of the International Health Board of the Rockefeller Foundation. The Board are thoroughly convinced that the prevention of disease is a paying concern, and that it is cheaper to possess a well-organized and trained service to remove the conditions favourable to epidemics and endemics than to sustain the economic losses attaching to the prevalence of preventable disease. They preach it everywhere they go, and more than this, they demonstrate it. The Board have been carrying on field experiments in town and country for a number of years with the object of showing that the control of malaria is practicable in town, village and country, and is a paying concern. Having succeeded on a small scale they, in 1920, with the help of the United States Public Health Service, extended their operations to fifty-two small towns for demonstration purposes, and in 1921 to another twenty-six, with the result that malaria cases were reduced from 30 to 98 per cent. at an average cost per head of about 78 cents.

As one illustration out of many similar ones, Bamberger, a small town in South Carolina, in the year 1918, spent on malaria alone some 24,000 dollars in the form of wages lost, doctors' bills and medicines, and in 1919 over 35,000 dollars, whereas, in 1920, when anti-malarial measures were put into operation, it spent 5,000 dollars, and in 1921 less than 1,000 dollars.

The Board's preventive work on hookworm disease in different parts of the tropics is well known, and its bearing on the physical and mental condition of those formerly affected. In this connection it is particularly instructive to note that, in the counties of the Southern States where the work has been carried on, the reduction in hookworm has not only removed a menace to health and working efficiency, but it has also caused a decline in the incidence of dysentery and typhoid fever, while at the same time the economic and social changes have been as remarkable as the improvement in health.

Apart from any renewed efforts on an organized, suitable, wider and economical basis, such as I have advocated elsewhere, by British local Governments to ameliorate unhealthy conditions in the tropics and prevent epidemics, one question may be asked, and it is this: Seeing the importance it is to the Empire that our tropical regions should be fully developed, are no British Rockefellers to be found to assist financially the newly founded Tropical Disease Prevention Association, which has for its object to work in conjunction with the

local Governments in their difficult task, and do for the British tropical possessions what the American Rockefeller is doing, not only for his own country and her possessions, but also internationally?

A DETAILED ACCOUNT OF METHODS OF EARLY DIAGNOSIS OF SYPHILIS IN H.M.S. "HOOD."[1]

By Surgeon Lieutenant-Commander A. J. Tozer, R.N.

Recognizing the great importance of early diagnosis and treatment of this disease, a description is given in detail of the methods adopted in this ship in order that it might be found possible in the immediate future for every medical officer to make his own diagnosis.

The importance of this need not be emphasized, and it is submitted that with a little care it becomes a matter of almost mechanical simplicity.

Requirements.—(1) Patient with sore; (2) microscope and ship's bacteriological set; (3) dark ground condenser; (4) illuminant—preferably a small arc lamp, which could be made on board from a plan, or failing this, a 200 c.p. frosted bulb with a lens in front, e.g., a flask of water.

The method to be described is not thought to be original, but has been most satisfactory and does not involve the slightest risk of auto-infection; in fact, the operator's hands do not come in contact with the patient at all.

The sore is first bathed in weak saline solution, and the patient is told to grasp the prepuce on either side of the sore with the finger and thumb of each hand (this is demonstrated by picking up a fold in his coat in the same manner). He is then told to squeeze the sore in concertina-like manner until a drop of serum exudes, which is transferred to a platinum loop. At this stage the sore is dressed with saline and the patient is sent away.

The serum is transferred to a clean microscope slide and mixed with one drop of saline 5 per cent., a cover-glass is dropped on to the slide and squeezed flat with filter paper. The slide is then ringed with vaseline and is ready for examination.

All microscopic examinations should first be made with 1/6 objective, because there is thus a much larger field, and the object more sharply defined and illuminated.

A stop is placed inside the 1/12 objective, the dark ground condenser fitted, and the source of light so arranged that a circle of light strikes the centre of the plane mirror.

A drop of cedarwood oil is next placed on the top of the condenser, and another drop on the under surface of the slide to be examined, and the slide is placed on the stage of the microscope, the condenser being slowly raised until the two drops coalesce.

When using 1/6 objective no oil is required on the upper surface of the slide.

The objective is then racked down close to the slide, and the mirror is manipulated until the light is found to shine through the centre of the condenser. Focusing should now take place, and when the objects are in focus the mirror can be finally adjusted until the various cocci, cells, spirochætes, &c., show up as incandescent objects on a black background.

The cocci will be readily recognized by their rapid and continual movement, and the spirochætes will also be recognized by their uniform spiral appearance and their typical movements. It will, of course, be necessary to differentiate between the *Spirochæta pallida* and spirochætes often found in the same slide.

To use the 1/12 objective it is necessary to place a drop of cedarwood oil on the coverslip, rack down the objective until focus is obtained.

At first this is somewhat difficult, for one is often confused by focusing specks of dust, air bubbles, &c., and it is necessary to focus beyond these to get the right focus. This is readily recognized by observing the large number of actively motile cocci. Before pronouncing a negative opinion, at least three separate examinations should be made on different dates.

[1] Abstracted from the *Journal of the Royal Naval Medical Service*, vol. viii, No. 3, July, 1922.

TRYPANOSOMA RHODESIENSE IN A CASE OF SLEEPING SICKNESS FROM THE SUDAN.[1]

By R. G. Archibald, D.S.O., M.D.

Three cases of human trypanosomiasis were recently brought to Khartoum by Capt. Mackinnon, M.C., R.A.M.C., Medical Officer in Charge of the Sleeping Sickness Camp at Tembura, in the Bahr-el-Ghazal Province of the Sudan.

Gland puncture carried out two months previously had proved positive for trypanosomes in all three cases; in order, however, to minimize the possibility of spreading infection during their journey through fly-infested areas, each patient had received two injections of 0·5 grm. atoxyl.

On arrival in Khartoum gland puncture was again carried out, but trypanosomes could not be found in the several preparations examined; it was decided, however, to inoculate animals with the gland juice obtained from one of the patients. The case selected showed evidence of somnolence with a well-marked enlargement of the lymphatic glands of the neck and axilla, as well as a slight degree of pyrexia. An emulsion of the gland juice with a sterile 1 per cent. solution of sodium citrate was prepared, and inoculated subcutaneously into three healthy gerbil rats.

At the end of sixty-six days one of these rats showed an intense infection with trypanosomes in

[1] Abstracted from the *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 3, October, 1922.

its peripheral blood; stained preparations demonstrated the presence of posterior nucleated forms.

Further details regarding this trypanosome and its pathogenicity for various animals will be published later, but it suffices to say that its morphological characters and pathogenicity for animals justify the conclusion that the trypanosome is *Trypanosoma rhodesiense*, an opinion shared by Professor Warrington Yorke, who kindly examined stained blood films from infected rats, as well as other data submitted.

Investigations regarding the insect carrier of this trypanosome remain to be carried out; it is of interest, however, to note that *Glossina fuscipes* and *G. morsitans* are ubiquitous in the district of Tembura.

DIAGNOSIS OF TYPE OF INFECTING PNEUMOCOCCUS IN CEREBROSPINAL INFECTIONS BY PRECIPITIN TESTS APPLIED TO THE SPINAL FLUID.[1]

By Brevet Lieutenant-Colonel H. Marrian Perry
and
Major J. A. Manifold.

The determination of type of the infecting organism can be effected either by isolation of the pneumococcus by means of animal inoculation and subsequent agglutination tests with specific type serums, or by means of the precipitin test, the patient's urine being employed as the antigen, and the test made with clear and non-hæmolysed specific serums of the three types. The former method has yielded the most satisfactory and consistent results. Rapidity in determination of type of the invading organism is essential in order that specific serum treatment can be commenced at the earliest opportunity.

With reference to diagnosis of the type species of organism responsible for the infection on cerebrospinal meningitis of pneumococcal origin, the method of isolation of the organism is recommended, but the necessary delay attendant on this procedure reacts unfavourably on the possibility of successful serum treatment. It is more especially in this connection that the precipitin test may be expected to yield results almost as consistent as those following agglutination tests applied to the coccus itself.

The readiness with which the pneumococcus undergoes autolysis in the fluid in which it is growing, and the fact that in the great majority of cases of pneumococcal cerebrospinal meningitis it is present in pure culture, are facts which increase the probability that the spinal fluid withdrawn by lumbar puncture will act as a satisfactory antigen. Further, the fact that the pneumococcus in the early stages of its growth forms a readily soluble substance which diffuses into the culture medium *in vitro*, and in human and animal infections is present in the blood, and that this soluble specific substance is not attributable to the death and subsequent disintegration of the organism, suggests that precipitin tests with the spinal fluid are likely to yield successful results.

These results were ascertained by the recent investigation by the authors of a patient suffering from cerebrospinal meningitis due to the pneumococcus. The type of the infecting organism was very clearly defined by a precipitin test applied to the spinal fluid, and was subsequently confirmed by agglutination of the isolated organism.

Method of Making the Test.—The cerebrospinal fluid is centrifugalized, and the supernatant fluid pipetted off the mass of deposited cells and organisms. This clear fluid is distributed in three tubes of narrow calibre, 0·5 c.c. being put in each tube. The same quantity—0·5 c.c.—of type serum for type 1, 2 and 3 pneumococcus is added to each of the three tubes. The reaction becomes evident either immediately or after an interval, as a fine haze at the junction of the liquids, and subsequently as a clearly defined precipitate in the tube containing the mixture of cerebrospinal fluid and the type pneumococcal serum corresponding to the infecting organism. It is essential that the pneumococcal serums employed should be free from hæmolysed red cells and crystal clear.

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, vol. xxxix, No. 3, September, 1922.

Medical News.

PUBLIC HEALTH IN BRITISH HONDURAS.

The Governor of the colony in his annual report calls attention to the satisfactory health condition of the country, adding, "Those who live there wonder how many years will elapse before the generality of people will realize that for Europeans leading a normal life and taking common precautions, the climate will be found salubrious, pleasant and healthy. Leaving out 1918, in which year there was an epidemic of influenza, the death-rate taken over a number of years approximates to 26 per 1,000, and over one-fifth of this number of deaths occurs in children under 1 year of age, who more often than not die through the neglect of their parents and not on account of the climate."

THE JOURNAL OF
Tropical Medicine and Hygiene
DECEMBER 15, 1922.

THE *LINGUATULIDÆ* AS PARASITES OF MAN.

THE present issue of the Journal is entirely occupied by the second and last part of Dr. Sambon's Revision of the *Linguatulidæ*, a family of vermiform parasitic mites, several species of which are known to attack man. Possibly, some of our readers, not specially interested in parasitology, may consider it unwise that we should give so much space to one subject, but it is sometimes useful to focus attention on a particular subject when it is of special interest and importance. Moreover, it was desirable to include the whole of Dr. Sambon's paper into the one volume, and his work—an original work which has required much literary, field and laboratory research—deserved both space and notice.

As a cause of sickness within the tropics, porocephaliasis is claiming every day greater attention, especially in Africa, where its prevalence and pathological importance have been fully recognized. But tongue-worms undoubtedly play a subtle, unrecognized part also in other parts of the world. The prevalence of *Linguatula serrata* in Europe was recognized long ago, after Zenker (1854) first discovered it encysted in the liver of man. This tongue-worm is frequently found at autopsies in Germany and Austria; more rarely in Russia and Switzerland. Virchow was one of the first to draw attention to its frequency and possible importance in human pathology. The same species has been recorded from Asia, Africa, America and Australia. It is a cosmopolitan species, because many of its hosts (man, dog, rat, cattle) are cosmopolitan. Darling and Clark (1912) have reported two cases from Panama, one in a native of Nicaragua, the other in a native of Central America. A third case is mentioned by Faria and Travassos from Rio Janeiro. But there are several other species which are known to attack man in their respective distributional areas within the tropics, and some of them are very formidable parasites. *Armillifer armillatus*, previously known as *Pentastomum constrictum*, was described first by Pruner as a parasite of man in 1847, when he discovered it at the autopsy of two negroes who had died in Cairo, one of peritonitis, the other of ulcerative colitis. In both cases there were numerous specimens eucysted on the surface of the liver, on the mucous membrane of the small intestine, and on the mesentery. Soon after, Bilharz (1851) described two other cases with parasites encysted on the surface of the liver. Then followed a third case by Bilharz, also in Cairo, and a fourth one by Aitken (1866) in a negro soldier who died in Jamaica from peritonitis with several tongue-worms in liver and lung. Aitken also described some specimens in the Museum of the Army Medical Department, Netley, from a case of porocephaliasis observed in Bathurst, Gambia, in 1854. Marchoux and Clouard found this tongue-worm in the liver and mesentery of a Senegalese soldier who died at Saint Louis of meningitis. Chalmers (1899) found it in a negro of Mendi race from Sierra Leone who died at Accra. "Great numbers of parasites were observed moving freely in the abdominal cavity over the surface of the various organs, to which some were also observed to be attached. The liver contained in its substance and projecting on to its surface a large number of cysts, each containing a clear fluid in which lay a single parasite coiled up. The substance of the liver was congested and the organ was enlarged. Large numbers of parasites were found in the small intestine, except the duodenum. At places in the small intestine there were signs as though the parasites were in the act of passing from the lumen of the bowel through the wall of the intestine into the peritoneal cavity. The peritoneum everywhere showed signs of old peritonitis. The lungs were markedly congested and œdematous, and the bronchi were inflamed. Both projecting on the surface and imbedded in the substance of both lungs there were numerous cysts like those found in the liver, and in each of these a parasite was found." After Chalmers, more and more cases were reported from all parts of West Africa: from the Senegal, the Gold Coast, Nigeria, the Cameroons and the Congo. Among the most recent and important papers are those of Broden and Rodhain (1910), Macfie and Johnston (1913), Füllerborn, Seiffert, Shaefer, Corin, Gros, Noc and Nogue, and the excellent paper by Noc and Curasson published in 1920 in the "*Bulletin de la Société de Pathologie Exotique*." All these authors have drawn attention to the great prevalence of porocephaliasis in the natives of tropical Africa. Seiffert found it seventeen times in 218 autopsies (7·8 per cent.) in Cameroons, Schaefer nineteen times in 150 (12·6 per cent.), also in Cameroons, Broden and Rodhain thirty times in 133 post-mortems (22·56 per cent.) in the Congo. Some of these authors gave the name of *Porocephalus moniliformis* to the species that most commonly attacks man in Africa, but in 1910 Sambon clearly defined the species and showed that, contrary to the belief of Mégnin, Neumann and Looss, *Armillifer* (*Porocephalus*) *moniliformis* and *Armillifer* (*Porocephalus*) *armillatus* are two different species, the former belonging to the Oriental region, and inhabiting in its adult stage the respiratory tract of the Indian Pythons, the latter belonging to the Æthiopian region, and inhabiting the pythons of Africa and several vipers of the genus *Bitis* in their adult stage; the most varied mammals in their nymphal stage.

With regard to other countries information is as

yet exceedingly scanty, and the parasites found have been, as a rule, erroneously determined. Tongue-worm infection of man, other than *Linguatula serrata*, has been reported from India, Java, the Philippine Islands, South and North America. The Indian case, reported by F. H. Welch in 1872, was that of an encysted nymphal form with geminate hooks as in Leuckart's *Pentastomum najæ*, but neither Welch's description, nor his figures, can lead to a correct determination of the parasite which he believed to be an *Echinorhynchus*. The Java case was reported by Dr. Salm in 1906 as one of *Pentastomum constrictum*, which, following the general belief, he considered to be the larval form of *Armillifer moniliformis*. The Philippine case was described in 1907 by Herzog and Hare, and the parasite forwarded to Dr. Stiles for determination. Stiles suggested that it might be a specimen of *Pentastomum constrictum*. In 1869, Sir William Osler saw a case in Toronto. The parasite was determined by Professor Hincks as a specimen of *Porocephalus constrictum*. Finally, in 1876, Dr. Austin Flint, at a meeting of the New York Pathological Society, exhibited a specimen of "*Pentastomum constrictum*" received from Dr. M. Campbell of Albany, Gentry Co., Mo. Dr. Sambon has shown that in all these cases the determination was erroneous. The parasites found in the Java and Philippine cases undoubtedly belonged to the Oriental species *Armillifer moniliformis*. This Sambon argues from the descriptions given and from the fact that the adult form occurs in the Malay Python, and specimens have been sent to him both from Java and the Philippines. The American cases could be ascribed to neither the African species nor the Oriental one, but must have been due to infection by American species, probably a species of *Porocephalus* such as *P. crotali*, which has a wide geographical distribution both in North and South America, and the larval form of which is known to affect many different kinds of mammals.

Porocephaliasis, as a disease, is not easy to diagnose, especially when it is not even suspected. Some tongue-worms, such as the various species of the genus *Linguatula*, the adult forms of which inhabit the nasal cavities and frontal sinuses of mammalians, give rise to catarrh, epistaxis and suppuration, but the majority attack man in their larval stage. These are found, as a rule, encysted in the liver, lungs, mesentery, intestinal walls, mesenteric glands, rarely in kidney, spleen or brain. In several instances the parasites have been found dead and calcified, in others out of their cysts and moving freely within the body cavity; this may have occurred after the death of the host when, as a rule, the parasites pass from intermediary to definitive host. When the parasites are few, the host may escape serious injury, but, not infrequently, heavy infections are met with. In such cases there can be no doubt as to the gravity of the illness.

A few words are necessary with regard to Dr. Sambon's classification. In 1898, Professor (now Sir Arthur) Shipley published in Blanchard's "*Archives de Parasitologie*," a Revision of the Family *Linguatulidæ*. Following Hoyle, he divided the family into two genera: *Linguatula* Frölich and *Porocephalus* Leuckart, a division first suggested by Professor Leuckart in 1860. Under these two genera he described four species of *Linguatula* and twenty of *Porocephalus*. Two of the species being only larval forms of others, his valid species amounted to twenty-two.

In 1909, in his article on "Pentastomida," contributed to "The Cambridge Natural History," Shipley divided the family into three genera, viz., *Linguatula*, *Porocephalus* and *Reighardia* Ward. The species enumerated were twenty-six, but only twenty-two were valid.

In 1910, Dr. Sambon established a new genus, which he called *Raillietiella*, and described six new species, thus bringing the number of genera to four and the number of species to twenty-eight.

In the present work he divides the family into two sub-families (*Raillietiellinæ* and *Porocephalinæ*), thirteen genera and forty-six species. All the new genera and the majority of new species have been added by Sambon himself or by students who worked in his laboratory, with material collected by him and under his tuition.

Shipley in his Revision of 1898 gives a list of about 100 hosts, Sambon gives one of 174. But what makes Sambon's work of value is the way in which he has grouped the material, availing himself chiefly of external characters and of a few easily seen anatomical features. What proves most convincingly the correctness of his classification is that his genera, based solely on morphological characters, have of themselves fallen into separate zoological groups.

Hitherto the *Linguatulidæ* have been greatly neglected, almost ignored, for the want of a reliable guide. Sambon's synopsis of the group renders their determination easy, their study interesting. Both zoologists and physicians will be grateful to him for his lists of hosts and synonyms, for the scattered and often inacessible literature which he has collected and placed at their disposal, for the useful list of species according to regional distribution, and, above all, for his clear, exact diagnosis of genera and species. Dr. Sambon has added considerably to our knowledge of the *Linguatulidæ*, and his work will no doubt be duly appreciated.

The Influence of Age and Temperature on Bacterial Vaccines (W. F. Harvey and K. R. K. Iyengar, *Indian Journal of Medical Research*, vol. x, No. 1, July, 1922).—A fowl cholera vaccine does not deteriorate in antigenic potency with age or with subjection to the action of any temperature to which it is likely to be exposed within six or nine months from date of preparation.

A SYNOPSIS OF THE FAMILY *LINGUATULIDÆ*.

By Louis Westenra Sambon, M.D., F.Z.S.
Lecturer to the London School of Tropical Medicine.

(*Continued from p.* 206.)

New Species described since the Publication of my "Synopsis of the Family Linguatulidæ." Part I.

Raillietiella mabuiæ Heymons, 1922.

This linguatulid was described by Von R. Heymons from specimens collected in Lüderitzbucht, West Africa, by L. Schultz (*Zoologischer Anzeiger*, October 27, 1922), from the lungs of an African skink, *Mabuia sulcata* Peters.

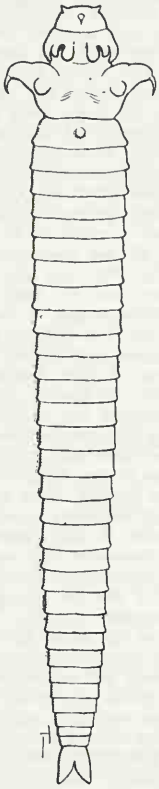


Fig. 1.—*Raillietiella mabuiæ* (after v. Heymons).

Heymons bases his description on a female 10 mm. long, the posterior portions of two other, probably larger, females, and a small specimen 3 mm. long.

The cephalothorax or prosoma, which Heymons calls capitulum, is composed of three distinct segments, one anterior bearing the mouth, and two following provided each with a pair of hooklets. The oral segment presents, moreover, two short conical appendages placed ventrally above the mouth, at the anterior extremity of the body. They are sensory-papillæ. The mouth is placed on a small rounded eminence and forms a longitudinal three-cornered opening. The hook-segment immediately following is broader than the oral segment, and provided with hooklets similar to those of other known *Raillietiellæ*, with three surrounding protuberances (*lobi parapodialis*), an outer, an inner and a median. The outer lobe is the largest, the middle one, beneath which the hooklet lies, the smallest. The hooklet is simple, without any accessory spine. This first hook-segment bears a pair of long dorso-lateral appendages. The second hook-segment is larger and broader than the first. Its hooklets are much larger, more sharply curved, and provided with wider bases. Each one tips the extremity of a non-jointed parapodium-like projection flanked by rounded lobes, one on each side. There are no sensory-papillæ on this segment. The number of body segments cannot be well determined, but there appear to be about thirty. Each segment consists of two portions, one anterior, the other posterior. At the posterior end of the body are two terminal cone-shaped appendages between which the anus opens. The female genital aperture is placed on the first body ring.

Of the inner organs, one can discern the straight intestine, the dorsally placed ovary, and the ventral sacciform utero-vagina filled with undeveloped ova non-operculated and provided with double envelopes.

Notwithstanding the greater parapodium-like projection of the hook-tipped appendages on the posterior hook-segment, Heymons correctly retains this linguatulid of *Mabuia sulcata* in the genus *Raillietiella*, pointing out that it presents the characteristic features of the genus in its bifid posterior extremity, triple lobes, round hooks, anterior position of female genital opening and sacciform uterus.

Cephalobæna tetrapoda Heymons, 1922.

Several specimens of this linguatulid were collected in Paraguay by Fiebrig from the lung of a Crossed Viper (*Lachesis alternatus*).

Heymons examined six specimens, the smallest 8 mm. long, the largest 20 mm. His description is as follows:—

"The capitulum (cephalothorax) consists of a snout or proboscis-like oral segment and two hook segments. The proboscis, which is comparable with the oral segment of other Pentastomids, is directed slightly forwards, bent somewhat ventrally and of soft consistency, so that it can be shortened through retraction of the free end. Ventrally, at the anterior end of the proboscis, is the

rounded or oval mouth opening, which is drawn more deeply within the proboscis when the latter is retracted. At the anterior border of the proboscis, a little above the mouth, are two small oral papillæ, which are also withdrawn during retraction. Both the hook-segments are provided with pairs of non-jointed leg-stumps (*parapodia*), the distal end of which in the majority of specimens is retracted. Should these parapodinm-like appendages be fully outstretched they become twice as long and present, at their tip, an extended hooklet. The latter is rather short and strongly bent, its convex side covered by a small skin lobe. The hooklet is plainly visible within the

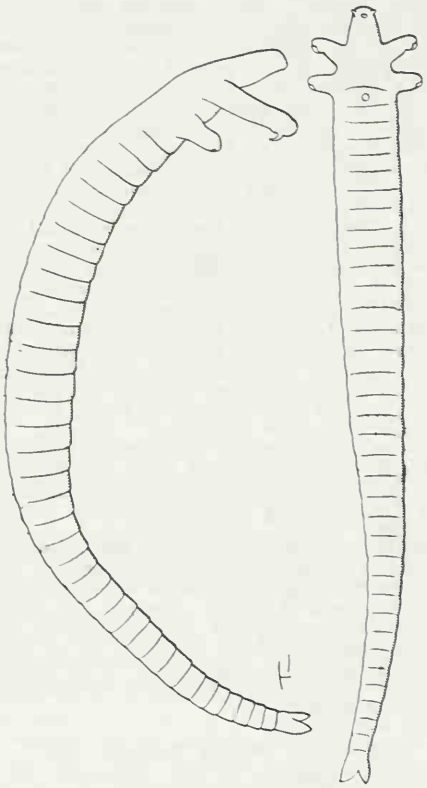


FIG. 2.—*Raillietiella tetrapoda* (after v. Heymons).

retracted *parapodium*. On both hook-segments, the hooks are simple (without accessory spines) and of nearly equal size. There do not seem to be any papillæ on the hook-segments.

"The body presents about thirty-five segments, each composed of an anterior and a posterior portion. The female genital aperture opens on a small papilla-like prominence situated on the first body segment. The posterior end of the body presents two terminal appendages, between which lies the anal opening.

"Owing to bad state of preservation the internal anatomy could not be profitably investigated."

Because of the four long extruded (parapodium-like) leg-stumps and the equally retractile proboscis-like oral segment, Heymons places this linguatulid into a new genus, for which he proposes the name *Cephalobæna* and the specific designation *C. tetrapoda*. Further, he suggests grouping the genera *Raillietiella* and *Cephalobæna* into a separate family *Cephalobænidæ*, characterized by anterior position of female genital opening, bifid posterior extremity and hook-appendages either long, parapodium-like, or provided with three knob-like projections (*lobes parapodialis*). This family, he says, would stand in opposition to another one characterized by posterior position of female genital opening, undivided posterior extremity, reduced oral segment and hook pockets without lobes, for which he proposes the name *Porocephalidæ*. This latter family would include the genera *Porocephalus* and *Linguatula*. The genus *Reighardia* he looks upon as intermediate, a kind of link between the two proposed families, erroneously believing it to have the female genital opening at the posterior extremity.

That the linguatulid of the Crossed Viper is a new and interesting species there can be no doubt, but I am inclined to retain it in the genus *Raillietiella*. It has all the characteristic features of the genus *Raillietiella*, and the differences are merely of degree, not of kind, therefore only specific. In the linguatulid of the African skink *Raillietiella mabuiæ*, the anterior hook-segment is provided with hooks surrounded by triple lobes exactly like those of other species of the genus *Raillietiella*, whilst the hooked appendages of the posterior hook-segment are modified into longer, more retractile leg-like protuberances, yet Heymons himself recognizes that this linguatulid is a *Raillietiella* and names it accordingly *R. mabuiæ*. The linguatulid of the Crossed Viper has not one, but both pairs of leg-rudiments greatly protuberant, and its oral segment is also somewhat longer and more retractible than the oral segment of other known species of *Raillietiella*, but all other features are similar, and I see no reason to place this lingnatulid in a separate genus.

The separation of the genus *Raillietiella*, characterized by anterior position of female genital opening, sacciform uterus and mouth anterior to hooks, from other linguatuids presenting female genital opening at posterior end, long coiled tubular uterus and mouth in a line with or posterior to hooks, is a very natural and desirable divisiou, and oue which I myself have suggested, includiug with *Raillietiella* the genus *Reighardia* which likewise presents anterior position of female genital opening, sacciform uterus and mouth auterior to hooks. My division of the family *Linguatulidæ* into the two sub-families *Raillietiellinæ* and *Porocephalinæ* has priority, however, because it was published some months before the one independently proposed by v. Heymons.

Alofia adriatica Hirst, 1922.

In September, 1922, Mr. Stanley Hirst published the description of a new species of linguatulid belonging to the Palæarctic region. His diagnosis is as follows:—

"Shape of body much the same in both sexes. It is of moderate thickness, the anterior end being narrowed, whilst the posterior end is a little enlarged, being the stoutest part of the body. Segmentation not very distinct; there are about seventy-two annulations (?). There is a distinct lateral line in the female. Chitinous supporting line of mouth shaped almost like a keyhole, whereas in *A. ginæ*, Giglioli, it is U-shaped. Also the distance between the two lines of hooks is much greater in the new species, and the curvature of the hooks themselves is different.

"*Measurements.*—Length of female, 21—35 mm.; width of anterior end (near hooks), 2 mm.; width of middle of body about 3 mm.; width of posterior end about 3½ mm. Length of male, 19 mm.

"*Locality.*—Adriatic; a male and a female specimen, from the Norman collection; host not given."

I have had the opportunity of examining Hirst's species and comparing it with those described by Dr. Giglioli. It is a valid species of considerable interest, being the third from Europe so far described. The host is not given, but the Norman collection to which it belongs is essentially an ichthyological collection and the locality mentioned—Adriatic—indubitably suggests the watery element.

The two Samoan species of *Alofia* described by Dr. Giglioli were given me for determination by the director of the zoological department of the University of Innsbruck without any record of host, and, in handing them over to Dr. Giglioli for study and publication, I suggested that they might be parasitic in fish. The host of *Alofia platycephala* is likewise unknown; Lohrmann suggested it might be the Alligator, but, though Crocodilians are the very hosts of other *Sebekini* (*Sebekia*, *Leiperia*), no Crocodilians are known to reach the Samoan Islands.

Sambonia lohrmanni Noc and Giglioli, 1922.

In the issue, September 1, 1922, of this Journal, Surgeon-Major Fernand Noc, French Colonial Troops, and Dr. George S. Giglioli proposed a new genus for a linguatulid of the Egyptian Monitor, first briefly and incompletely described by Lohrmann in 1889 under the name of *Pentastomum clavatum*, and paid me the compliment of naming it *Sambonia* in recognition of my endeavours to put some order into the rapidly growing group of parasitic Acarina, popularly known as tongue-worms.

In my classification of the *Linguatulidæ*, relying solely on literature, I had already placed this species in the section *Sebekini* and, dubiously, in the genus *Sebekia*. Later, through the courtesy

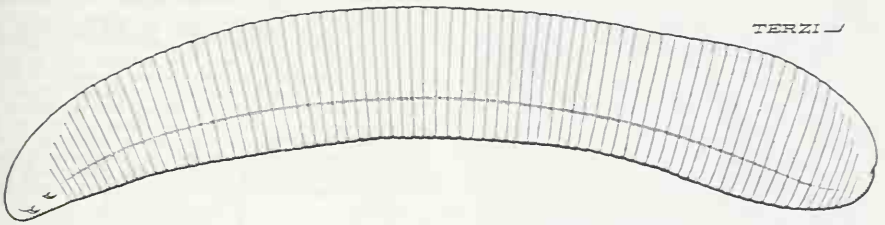


FIG. 3.—*Alofia adriatica*.

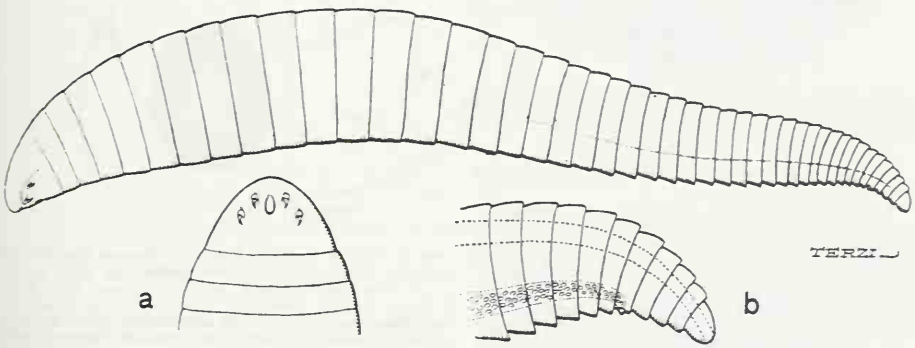


FIG. 4.—*Sambonia lohrmanni*. (*a*) Anterior extremity. (*b*) Posterior extremity.

of Mr. Stanley Hirst, I was able to examine some specimens of Lohrmann's linguatulid recently placed in the collection of the British Museum, and these I handed over to Dr. Giglioli for a closer study. Meanwhile, Dr. Noc had found and described the peculiar eggs of this linguatulid in the lungs of an Egyptian Monitor (*Varanus niloticus*) captured at Dakar, West Africa, in 1920. The lung contained not only numerous eggs of *Sambonia lohrmanni*, but also those of a filaria, which Mr. Bellis kindly determined as ova of *Filaria macrofallos*.

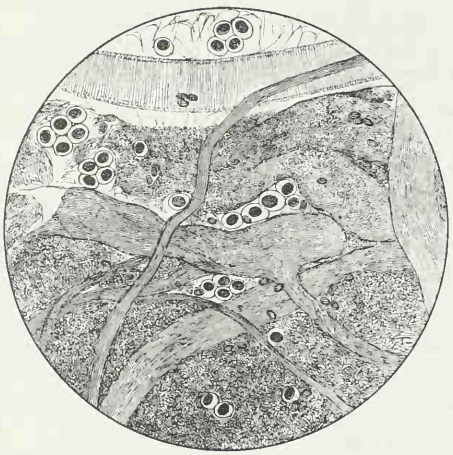


FIG. 5.—Lung of *Varanus niloticus* containing eggs of *Sambonia lohrmanni* and *Filaria macrofallos* in the alveolar tissue. (After Noc and Giglioli.)

Noc and Giglioli give the following description of *Sambonia lohrmanni*:—

"In the present paper we propose to add a fourth new genus to the section *Sebekini*, for the linguatulid of the Nilotic Monitor which Dr. Sambon had tentatively and doubtfully included in his genus *Sebekia*, placing a point of interrogation after the generic name. Chief characters of the genus *Sebekia* are the small, deeply serrated hooks, but neither Lohrmann nor Shipley had noticed any serrations on the hooks of the linguatulids they had examined.

"In 1920, at Dakar, Senegal, one of us found numerous tongue-worms in the lungs of a Nilotic Monitor. The parasites were especially numerous in the left lung. Later, a microscopical examination of the lung (fig. 5) revealed numerous eggs of two kinds, some occupying the bronchioles, others scattered about the alveolar tissue. One kind, smaller, oval, contained a coiled-up nematode worm, the parental forms of which—a filariid—were found in the pleural and peritoneal cavities; the other kind, larger, more rounded, covered with spines, enclosing an acariform embryo, and contained in large, round vesicles, were undoubtedly the ova of the linguatulid, similar eggs being found in the latter's utero-vaginal coils. This observation was mentioned in the "*Rapport sur le Fonctionnement de l'Institut de Biologie de Dakar*" for the year 1920.

"Although known since 1889, this linguatulid has not yet been adequately described. All our specimens are females, and measure from 16 to 18 mm. in length and 2·5 to 3 mm. in maximum width. The annulations number about forty-four. The cephalothorax is small, acuminate, and continues the body without any sign of demarcation. The body is flattened anteriorly on its ventral aspect, convex on the dorsal side. The oral papilla is large and ovate; its chitinous frame extends from the anterior hook-line to below the posterior hook-line. It belongs to the type which characterizes the genus *Sebekia*, but is larger and more massive at the base. The hooks are simple, equal, smooth and disposed in trapezoidal formation with posterior hook-line much longer than the anterior one, thus forming a low and broad trapezoid with greatly inclined sides. The whole hook apparatus (hook and root) is comparatively small. In the specimens examined by us the blades of the anterior pair protruded considerably more than those of the posterior pair. The blades are sharp, long, slender and caniculated, with strong and smooth base. When retracted they are practically ensheathetd by a chitinous laminar process projecting from the root. The ensheathing apparatus is best seen in mounted specimens. The papillæ are hardly visible; even the two more prominent ones above the anterior hooks, usually so conspicuous, are scarcely marked."

"The body is always more or less incurved. Its maximum width is about the junction of the anterior third with the middle one. The anterior half is fairly cylindroid, the posterior half tapers gradually towards the caudal extremity, which is markedly attenuate. The annulation is, as a rule, almost entirely effaced in the anterior two-thirds, owing to distension due to the expanding of the uterine coils, but it is clearly visible in the posterior third, especially on the ventral surface. Here the annulation is practically imbricate, each ring widening towards its distal end, and slightly overlapping

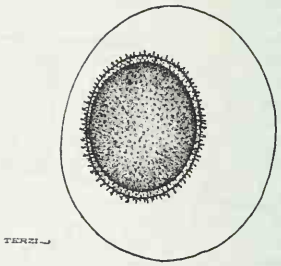


FIG. 6.—Egg of *Sambonia lohrmanni*, showing spinous shell. (After Noc and Giglioli.)

the following narrower and shorter one. The last segment is small and pointed; it bears the terminal anus. The female genital pore does not open on the terminal segment, as is the case in the great majority of *Porocephalinæ*, but on the fifth body ring counting from the posterior end.

"By examining clarified specimens, some of the anatomical features may be roughly made out. Thus one notices that the utero-vagina is tubular and much convoluted. Its development takes place principally within the anterior two-thirds of the body. The posterior third contains only the last tract, which runs in a straight line to the genital pore and part of the intestine, which appears to be straight and cylindrical. The spermathecæ also can be perceived at the anterior end, near the ventral side, placed in a line, one behind the other.

"The ova are highly characteristic. Indeed, they can be readily recognized at a glance, not only from those of other linguatulids, but from any other known eggs. Taken from the distal portion of the utero-vagina, with embryo already well developed, they measure on an average

78 by 65 microns. The large bladder-like envelope is not visible in the eggs so obtained, but is quite evident in eggs normally extruded, probably because this outer albuminous covering only becomes distended and apparent through the absorption of moisture. It is seen to perfection in the ova occupying the alveoli and bronchioles in our preparation from an infested monitor's lung (fig. 6).

"The chitinous shell of the egg is thicker than usual, and is beset with minute spines which give it a singular burr-like appearance. The longer spines measure 3·5 microns, and appear to be slightly clubbed and branched. These spines are seen only on mature eggs. Undeveloped ova taken from the upper portion of the utero-vagina have perfectly smooth shells devoid of spines like those of other species. The spines begin to appear when segmentation is fairly advanced, and they are at first very slender, straight and simple.

"The external morphological and internal anatomical characters given in the above description are, we believe, sufficient to establish definitely and satisfactorily the taxonomic position of the monitor's linguatulid. The tubular utero-vagina, long and much convoluted, at once places it in the sub-family *Porocephalinæ;* its cylindroid body, its small acuminate cephalothorax with hooks arranged in trapezoidal formation, indicate that it belongs to the section *Sebekini* of Sambon's classification. The imbricative annuli, the hooks provided with chitinized guards, the position of the female genital opening on the fifth body ring, and the spined eggs show that it belongs neither to any of the three genera (*Sebekia*, *Alofia*, and *Leiperia*) now constituting the section *Sebekini*, nor to any other known genera of *Linguatulidæ*. It is therefore the representative of a new genus of the *Sebekini*, for which we propose the name *Sambonia*, dedicating it to Dr. Louis Sambon, the distinguished scientist, who has so greatly contributed to our knowledge of this wonderful group of parasites attacking reptiles, amphibians, fish, birds, mammals and man. The species under consideration, inhabiting the lungs of the Egyptian Monitor (*Varanus niloticus*) and first discovered by Lohrmann in 1889, must, therefore, again change its generic appellation, but retain the specific name given it by Sambon in 1910, and be known henceforth as *Sambonia lohrmanni*.

"Whether the linguatulid found by Shipley in *Varanus exanthematicus ocellatus* be identical with the one inhabiting *V. niloticus* cannot be determined without carefully comparing specimens from both hosts. However, taking into consideration that both *V. niloticus* and *V. exanthematicus* inhabit the same regions and have similar habits, and judging also from analogous examples such as that of *Armillifer armillatus*, a linguatulid found in *Python regius* and *P. sebæ*, both specifically distinct African Boids with overlapping distributional areas, their identity seems likely."

In his paper of 1910, Shipley mentions specimens of *Porocephalus clavatus* Lohrmann (= *Sambonia lohrmanni*) from the lungs of *Varanus exanthematicus exanthematicus* collected in 1909 in Northern Nigeria by Mr. J. H. Ashworth. He considers them identical with those previously found by himself in *Varanus exanthematicus ocellatus* and by Lohrmann in *Varanus niloticus*, and this is likely, though his opinion is not based on a close comparative examination. Probably my *Porocephalus wardi*, found by Natterer in the body

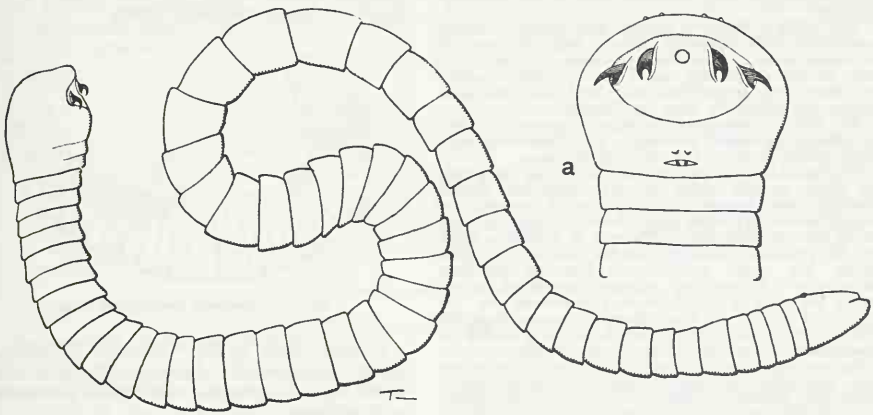


FIG. 7.—*Armillifer brumpti.* (*a*) Anterior extremity of male. (After Giglioli.)

cavity of the Common Teguixin (*Tupinambis teguixin*) may also belong to the genus *Sambonia*.

Noc and Giglioli give a diagnosis of the genus *Sambonia*. It may be described thus:—

Genus *Sambonia* Noc and Giglioli, 1922.

Generic Diagnosis.—Sebekini: Body incurved, tapering at both ends. Annulations (forty-four in type sp.), slightly imbricative, give the body outline a serrated appearance. Cephalothorax small, wedge-shaped. Mouth and hooks close to anterior border. Mouth ovate, placed between hook lines with longest diameter vertical. Hook-trapezoid low and relatively wide at base. Hooks simple, smooth, equal. Anus at terminal. Female sexual opening above terminal segment (fifth ring from posterior end in type sp.). Ova with strikingly characteristic spined outer shell. Parasite of Lizards.

Type Species: Sambonia lohrmanni (Sambon, 1910), Noc and Giglioli, 1922.

Armillifer brumpti Giglioli, 1922.

At a meeting of the Société de Pathologie Exotique, held on July 12, 1922, Dr. G. Giglioli described under the name of *Armillifer brumpti* a new species of tongue-worm from Madagascar. Both adult and immature forms had been found by M. A. Mocquerys: the adult in a snake, probably *Boa madagascariensis*, the nymphal encysted in the liver and lungs of a Tenrec (*Ericulus setosus*).

Dr. Giglioli's description is as follows:—

"*Female*.—None of the female specimens examined by me had reached full maturity. Dimensions: 83 mm. by 4 mm.

"The cephalothorax is rounded on its dorsal surface, flatteued and slightly coucave at the anterior part of its ventral surface which hears the hooks and mouth. Its longest diameter is the transverse. The hooks are disposed on a slightly arcuate line with convexity forwards. They are equal, smooth, simple, and provided with a large strong base and a sharp recurved blade as in *Armillifer armillatus*.

"The mouth is round or ovalish, with greater diameter transversal. It is placed on a level with the hases of the median hooks. Above the inner hooks, and somewhat nearer to the middle line, are two well-marked papillæ. Two others, less conspicuous, are placed somewhat more dorsally and outwardly than the former.

"The body is throughout cylindroid, gradually tapering towards its caudal extremity. It is somewhat more slender at its juuction with the cephalothorax.

"The annulation is well marked in all the specimens. The rings average about fifty-six; they are shorter anteriorly, hut become gradually longer towards the posterior extremity. They are narrow at their hase and overlap the following rings. The four or five rings which form the posterior extremity, save the last one, are again smaller. The caudal extremity is distinctly claviform and ends with a very long segment, bearing at its extremity the anus in the shape of a transverse slit. On the ventral surface, at a considerahle distance from the anus, is the genital pore. The latter is a round or crescent-shaped openings always plainly visihle.

"*Male*.—Dimensions: 37 mm. by 2 mm. Annulations 48-50. The hody, straight or slightly incurved, tapers considerably towards its posterior extremity. The cephalothorax is comparatively larger; and the hooks and mouth also larger than in the female. At the hase of the cephalothorax, on the mid-ventral line, near the junction of the first hody ring, is a small transverse slit, within which open side hy side, the two genital orifices. Ahove it are two small contiguous papillæ. The hody is flattened ventrally, particularly in its anterior half. The posterior end is not so markedly claviform as in the female.

"*Nymphal Forms*.—They have heen found in great numhers coiled up aud encysted within the hepatic aud pulmonary tissues of a Tenrec. The cephalothorax is rounded and slightly bent ventrally. The hooks are smooth, small, simple. The mouth is round. Length: 18 to 24 mm. Annulations ahout 48. They are well-marked and, though having the same shape, they are relatively shorter than in the adult. The hody is flattened ventrally, especially in its anterior half. The posterior extremity is conical and tapers sharply. The last segment is longer than the others and hears the anus. The genital pore is not visible.

"*Taxonomic Position*.—On account of its morphological and anatomical characters the systematic positiou of this new species is not difficult. The long tubular uterovagina obliges us to class it in the suh-family *Porocephalinæ*. The large, equal, smooth, simple hooks, the round mouth, and the arcuate disposition of these parts, the characters of the hody wall, the situation of the uterus coustantly ventral with regard to the intestine, the female genital pore placed on the terminal segment at a considerahle distance from the anus, are all characters typical of the genus *Armillifer*. I propose, therefore for this new, striking species the name of *Armillifer brumpti*, dedicating it to Professor E. Brumpt of the Paris Faculty of Medicine."

Species not included in the first part of my "Synopsis of the Family Linguatulidæ."

Porocephalus wardi Sambon, 1910.

This linguatulid was found by Natterer in the body cavity of a *Podinema teguixin* (= *Tupinambis teguixin*). Two males and one female were found 3 to 6 in. long. They are mentioned by Diesing and ascribed to the species (*Porocephalus crotali*) found by Humboldt in *Crotalus terrificus*. They are delineated on pl. IV, figs. 1-10, as illustrations of *Porocephalus crotali*, together with other very different tongue-worms (*P. stilesi*) from *Bothrops jararaca* (= *Lachesis lanceolatus*).

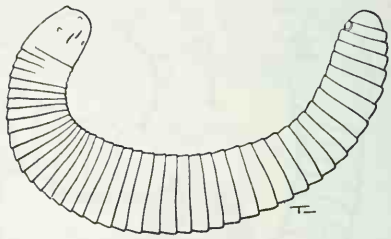


FIG. 8.—*Sambonia wardi* (after Diesing).

Diesing (1850) in his "Systema Helminthum" again mentions the Common Teguixin (*Tupinambis teguixin*) as one of the hosts of *Pentastomum proboscideum*.

Following Diesing, Shipley (1898) also mentions *Tupinambis teguixin* among the hosts of *Porocephalus crotali*.

Sambon (1910), whilst separating the various species (*Porocephalus crotali, P. stilesi, P. clavatus, Kiricephalus coarctatus, Kiricephalus pattoni*, &c.) previously confounded under the name of *Pentastomum proboscideum*, set aside the linguatulid of the Great Teju under the name of *Porocephalus wardi*, saying:—

"Finally, for the tougue-worm of the Great Teju, which I have not had the opportunity of examining myself, but which, judging from the drawings (figs. 1-10, Plate IV) in Diesing's monograph, and from the different Sub-order (*Lacertilia*) to which its host belongs is certainly a different species, I propose the name of *Porocephalus wardi* in honour of Dr. Henry B. Ward, of Nebraska, another distinguished American investigator who has contributed to our knowledge of the *Linguatulidæ*."

Relying chiefly and necessarily on Diesing's delineation of the Great Teju's linguatulid, I believe we can safely place this tongue-worm in the

section *Scbekini* of the sub-family *Porocephalinæ*, and more particularly in the genus *Sambonia* recently established by Noc and Giglioli for the tongue-worms of the *Varanidæ*. The linguatulid of the Great Teju resembles the tongue-worm of the Nilotic Monitor in size and general build, in the shape and number (about forty-four) of the slightly imbricative body rings and in the position of the female genital opening which in Diesing's figure is placed, not at the end of the terminal segment, as in the majority of known *Porocephalinæ*, but on the penultimate. This last character cannot be considered as an inaccuracy on the part of the delineator, because the figures of Diesing's monograph are drawn by Zehner, a capable and careful delineator. I take it, therefore, that the linguatulid of the Great Teju has its utero-vaginal opening on the penultimate ring as figured in Diesing's monograph. Finally, I may say that we should expect a close resemblance between the linguatulids of the *Teiidæ* and *Varanidæ*, seeing that the *Teiidæ* represent in America the old-world *Lacertilia* of the family *Varanidæ*.

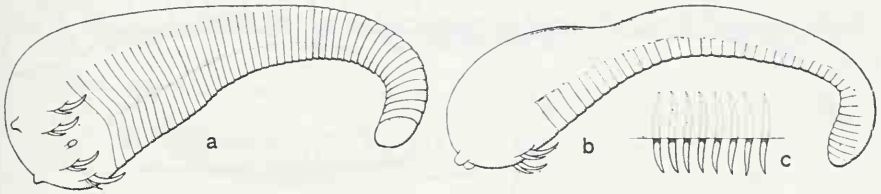


FIG. 9.—*Diesingia kachugensis* (after Shipley).

Porocephalus kachugensis Shipley, 1910.

In 1910, Sir Arthur Shipley described an encysted nymphal linguatulid found by Mr. Nelson Annandale, Director of the Indian Museum, in the liver of *Kachuga lineata*, a semi-aquatic Oriental tortoise.

Shipley's description is as follows:—

"The animals vary a good deal in size, the larger specimens being 12 mm. in length, the small 9 mm. The shape of the body is markedly club-shaped. The thicker or anterior end of the larger animals is 3-3·5 mm. from back to front, and 3·5-4 mm. from side to side. The body tapers somewhat suddenly, and the posterior two-thirds is from 1-1·7 mm. in breadth and a little less in depth. In their cysts the animals are all coiled up like a note of interrogation, and the coil is always in one plane.

"Anteriorly the head bears a pair of well-marked rounded papillæ which project forward. These recall the somewhat similar papillæ in *Porocephalus megastomus*, Diesing, but in this last-named species there are two others behind the mouth.

"The mouth is small and is placed about the level of the base of the inner hooks, which are slightly in front of those of the outer hooks. All four hooks project rather further than is the case with most Pentastomids, and they are very markedly double. This is also the case with *P. najæ-sputatricis*, *P. heterodontis*, *P. gracilis* and other species of *Porocephalus*.

"The number of annulations or rings is forty or forty-one. As in some other species it is extraordinarily difficult to count their number. This is chiefly due to the fact that at both ends, but particularly at the anterior end, the lines demarcating the annulations are very faint and it is difficult to decide exactly where the first begins and where the last ends. Then the anuulations do not appear to be true segments and no internal organs are serially homologous with them, so there is nothing hy which to check the number. In *P. kachugensis* the annulations are confined to the ventral surface, they cease suddenly a little way up each side of the body, and seen from the dorsal surface the animal is smooth and not ringed.

"The demarcating lines between the annulations are made more prominent hy bearing a row of some 150-160 fine chitinous rods, somewhat sahre-shaped. These pierce the cuticle and externally end in sharp points projecting backward. This is the first time I have seen such spines in a *Porocephalus*.

"There is a slight median ventral groove which is shown well in fig. 9a.

"The parasites were found encysted in the liver of a female *Kachuga lineata* Gray, one of the Indian and Burmese representatives of the family *Testudinidæ*. A piece of this organ shows that there can have been hut little of the tissue of the liver left; hut the ouly part sent to me was a small portion of the edge of the liver. The deeper parts may not have heen so heavily infected."

On account of the peculiar capsicum-like shape of its body, the limitation of the annulation to the ventral surface, the median ventral groove and the presence of accessory hooks and ring-border spines in its nymphal stage, I believe the linguatulid of the tortoise *Kachuga lineata* must be placed into a new genus, for which I propose the name of *Dicsingia* in honour of Dr. C. M. Diesing, who, by his monograph of 1835, laid the foundations of our knowledge of the *Linguatulidæ*.

Whether *Pentastoma megastomum* is to be included into this new genus of tongue-worms it is not easy to say, but certain features, some of them already pointed out by Shipley, make me think so.

Pentastoma megastomum Diesing, 1835.

This linguatulid was discovered by Prof. Aug. Fried. Schweigger in the lungs of Geoffroy's Terrapin *Phrynops* (= *Hydraspis*) *geoffroyana* Schweigg, and briefly described by Dr. Carl Moriz Diesing in 1835. Diesing's diagnosis is as follows: "P. clavatum, transversim lineatum, capite incrassato obtuso, fornicato, cauda acuminata; ore orbiculari maximo, subinfero, foveis semilunatim positis." In 1864 he adds: "Annuli corporis c. 75."

Leuckart (1860) calls it *Pentastomum megastomum*, and describes it thus:—

"Corpus clavatum, retrorsum attenuatum, acuminatum, annulato-plicatum, annulis linearibus. Os orbiculare maximum (inter bothria arcuatim disposita situm). Longit. fem. 11 mm., latitudo antice 2·2 mm., postice 7·0 mm."

Stiles (1893) places it in the genus *Porocephalus* under the name of *Porocephalus megastomus*.

Shipley (1898), who had the opportunity of re-examining the type specimens preserved in the Vienna Museum, gives the following particulars:—

"There are two specimens of this genus in the Museum at Vienna. The anterior end of the body is swollen, and reaches its greatest diameter at about one-eighth the body length from the anterior end. Both specimens seemed to be mature, and to be swollen out by the development of the generative organs; the rings were almost obliterated, but sufficient traces of them existed to show that they are very numerous (70-90). The very large mouth is perhaps their most striking feature."

"The female specimens vary in length from 78 to 94 mm., the average length being 82 mm. The width is 8 to 9 mm. There are twenty-two strongly projecting rings on the body and two or three indistinct ones on the head. Stigmata are numerous over the entire surface of the body.

"The single male specimen is 30 mm. long. The rings number about twenty-six.

"The hooks are simple and, together with the mouth, lie in a pit bordered by papillæ. The pit may be due to contraction after death, but this seems hardly likely, as it is found in all the specimens. The mouth is nearly circular and lies between the inner pair of hooks.

"The body tapers towards the posterior end. The terminal segment is small and conical; it bears the transverse, slit-like anus, in front of which lies the genital aperture in the female.

"The internal organs are, on the whole, typical, but in the female the anterior third of the ovary is paired. The ovary thus constitutes a Y-shaped structure, each arm of the Y passing directly into the oviduct of that side. I can find no mention of this condition in any other species.

"In general features the specimens bear a strong resemblance to *Porocephalus armillatus* Wyman, but differ from it in the following particulars:—

"(1) The body is relatively thicker than in *P. armillatus*.

"(2) The papillæ are differently arranged, and the two conspicuous papillæ in front of the mouth in *P. armillatus* are replaced by a small lobe.

"(3) The hooks are sunk in a pit and not so wide apart; the space between the two inner hooks is also relatively greater.

"(4) The rings are not so sharply defined. In the female there are twenty-two distinct ones and two or three indistinct, instead of nineteen altogether, and the postero-ventral margin of each ring has a slight projection in the median line instead of an indentation. Further, Wyman gives the number of rings in the male of *P. armillatus* as 'fourteen distinct rings and four partly defined,' while here there are twenty-six.

"(5) The anal segment is more obtuse.

"Through the courtesy of the authorities at the British Museum (Natural History), I was able to look through a small collection of Pentastomids in their possession. Among these specimens was one unnamed, from the horned viper or puff-adder. From a superficial observation it appeared to agree in all respects with the species described above."

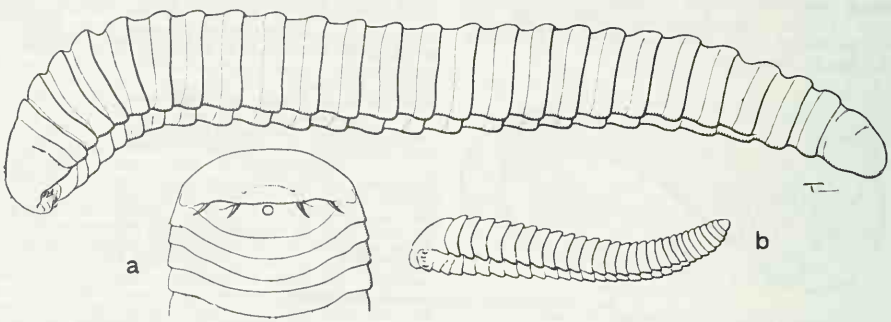


FIG. 10.—*Armillifer grandis*. (*a*) Anterior extremity of female. (*b*) Male.

There can be little doubt that we have here a new genus of tongue-worms peculiar to the Chelonia, but the descriptions of Diesing, Leuckart and Shipley are incomplete (position of genital openings not mentioned, no anatomical details), and far too meagre to permit more than the mere suggestion of a separate genus. Probably it will fall in the new genus *Diesingia* which I have proposed for the linguatulid of *Kachuga lineata* described by Shipley in 1910.

Porocephalus grandis Hett, 1915.

In 1915, in the *Proceedings* of the Zoological Society of London, under the name of *Porocephalus grandis*, Miss Mary L. Hett described a linguatulid collected from the Gaboon Puff-Adder (*Bitis gabonica*), the Horned Puff-Adder (*Bitis nasicornis*), and the Cerastes Viper (*Cerastes cornutus*).

Miss Hett's description is as follows:—

"There were in all seven specimens of this Pentastomid obtained from African vipers.

"The male specimen is probably mature; the female specimens are certainly so, the uterus in all cases containing embryos in different stages of development.

Though resembling *Armillifer armillatus* and inhabiting the same vipers, *Porocephalus* (= *Armillifer*) *grandis* Hett is a valid new species. Quite

recently I have come across two small male specimens of *Armillifer grandis* in the lung of a Horned Puff-Adder (*Bitis nasicornis*). One of them measures 15 mm., the other only 10 mm.; both present twenty-eight distinct rings. Further, through the courtesy of Surgeon-Major Noc, I have had the opportunity of examining an immature female specimen of *A. grandis*, collected in 1920 by Dr. Chabanaud from the lung of a Gaboon Puff-Adder (*Bitis gabonica*), and now in the collection of the Paris Natural History Museum. This specimen measures about 50 mm. in length by 6 mm. in maximum width at the anterior extremity just behind the cephalothorax. Posteriorly it ends in a smooth rounded cone. The ventral surface presents a deep triangular groove which, beginning widely beneath the incurved cephalothorax, ends in a point about the eighteenth ring. A similar groove is seen in both male specimens. The annulations number twenty-five. *Armillifer grandis* seems to be a parasite of the African vipers. So far, it has not been found in Pythons.

Pentastomum moniliforme Mazza, 1898.

In 1898, Dr. Felice Mazza, in a paper entitled "Contribution to the macro- and microscopic anatomy of *Pentastomum moniliforme* Dies.," describes some specimens of a linguatulid collected in New Guinea by the distinguished Italian traveller, Lamberto Loria. Mazza's description, made into English, reads as follows:—

"There were five specimens of *Pentastoma* which, on account of the general body shape and more salient characters, without doubt, must be ascribed to the species *Pentastomum moniliforme* described by Diesing and others. However, I must point out that the specimens examined by me differ from those described by the above-mentioned authors (Diesing and Mégnin) in the

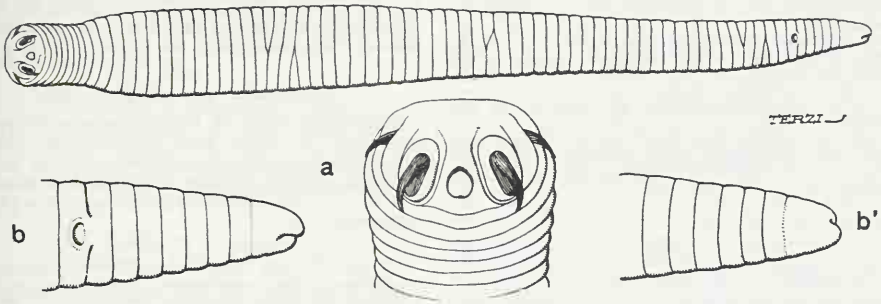


FIG. 11.—*Waddycephalus teretiusculus*. (*a*) Anterior extremity. (*b*) Posterior extremity of female, ventral aspect. (*b'*) Posterior extremity of female, dorsal aspect.

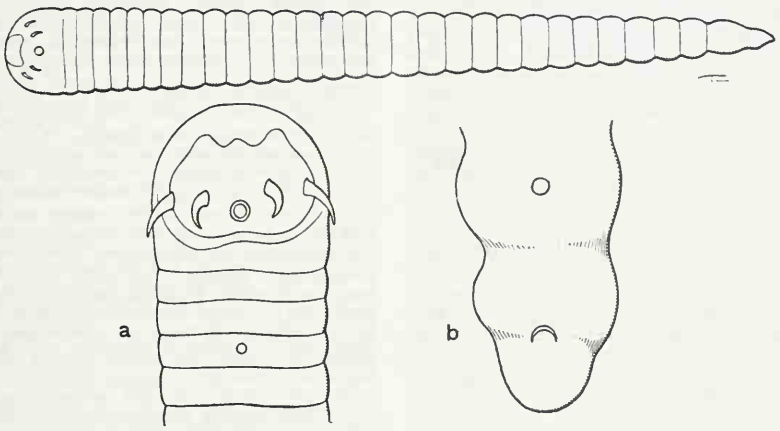


FIG. 12.—*Waddycephalus mazzai*. (*a*) Anterior extremity of male. (*b*) Posterior extremity of female. (After Mazza.)

number of rings which varies in the different specimens between thirty-eight and forty-five, whilst Mégnin gives twenty-six and Diesing twenty, as also in the total length of the body (41 to 44 mm.).

"They differ, moreover, in the position of the anal and female genital openings because, according to Diesing, the vagina opens close to the anus, whilst in my specimens it is placed on the ventral surface of the third segment from the posterior extremity. The anal opening is situated ventrally in a groove formed by the posterior border of the penultimate segment and the anterior border of the terminal one, whilst, according to Diesing and others, it should be at the posterior extremity of the body, though this does not seem to be definitely ascertained.

"I have been unable to observe any kind of pore or stigma in the cuticle. The hooks are disposed in an arcuate line with the convexity forward. The outer hooks are turned somewhat obliquely outward. The height of the hook measures 91 microns, the total length 520 microns.

"The oral opening is provided with a chitinous ring which holds it somewhat agape, especially in its lower portion. At this point the chitinous ring has greater thickness than in the upper part, where it is very thin and mobile. The mouth is followed by a pharynx also lined by a chitinous layer."

From the above description, it is obvious that Mazza's linguatulid cannot be *Pentastomum* (= *Armillifer*) *moniliformis*. As Mazza himself points out, it differs in the number of annulations and in the position of the anal and female genital openings. Taking into consideration the zoogeographical region to which it belongs (Papuan sub-region of Australian region), the position of the female genital opening constantly on the third body ring from the posterior extremity, the location of the anus at the distal border of the penultimate segment, the triangular shape of the mouth opening and the oblique, lateral direction of the outer hooks, I am led to place it in the genus *Waddycephalus*. This Australian genus is no doubt already represented in New Guinea by its type species, *Waddycephalus teretiusculus*, because one of its known hosts, *Diemenia psammophis*, is found both in Australia and New Guinea. Mazza's species differs from *Waddycephalus teretiusculus* in the number of annulations (38—45 instead of 65—76) in the integrity of the terminal segment and in the position of the female genital opening (third instead of eighth ring from posterior extremity), therefore it represents a new species, for which I propose the name of *Waddycephalus mazzai*, dedicating it to the Italian zoologist who brought it to our notice.

Pentastomum heterodontis Leuckart, 1860.

This species was described and named by Prof. R. Leuckart (1860) in his Monograph of the Pentastomida. The diagnosis is as follows:—

"Species, quam in statu imperfecto solo hucusque observavimus, corpus exhibet cylindricum, postice attenuatum, antice clavatum. Frons rotundata, clavata. Articuli c. 58, brevissimi, fimbriati, stigmatibus unicam seriem formantibus perforati. Hamuli geminati, inaequales, altero (accessorio) graciliore, altero (principali) valido, crasso, bene curvato. Fulcrum latum, elongatum, rotundatum. Longit. corporis 6·3 mm., latit. 0·65 mm. Habitat in musculis abdominalibus peritonaeoque heterodontis, folliculo inclusum."

The host of this species has not been specifically determined. *Heterodon* is a genus of snakes peculiar to North America with three species: *H. platyrhinus*, United States, east of Rocky Mountains; *H. simus*, Mississippi and South Carolina; *H. nasicus*, United States, west of Mississippi, New Mexico. But the name *Heterodon* is also a synonym of other Ophidian genera inhabiting either India or Africa. Thus it is a synonym of *Lioheterodon*, which has three species in Madagascar, and of *Lytorhynchus*, which has species in Asia and Northern Africa. Therefore, we cannot be certain of its habitat.

Pentastomum najæ Leuckart, 1860.

Under the names of *Pentastomum najæ-sputatricis* and *P. najæ*, Prof. R. Leuckart (1860) described the nymphal form of a linguatulid which he found encysted between the abdominal muscles and over the peritoneum of an Indian Cobra (*Naja tripudians*).

Leuckart's diagnosis is as follows:—

"Corpus in statu imperfecto cylindricum, retrorsum attenuatum, postice acuminatum. Cephalothorax minime distingueudus, fronte rotuudatus. Annuli circa 50 brevissimi, serrulati, duobus ordinibus stigmatum alternatim dispositis perforati. Hamuli geminati inaequales, altero (accessorio) subulato, altero (principali) uncifórmi, fulcro lato, breviusculo, rotundato insidentes, anteriores posterioribus paulo majores. Uncinorum curvatura ad basin approximata, apice paene recto. Longitudo—4·5 mm., latitudo maxima—0·6 mm. Habitat in musculis abdominalibus et peritonaeo najae sputatricis, folliculo inclusum.

"Status evolutus hucusque ineognitus."

Diesing (1864) believes this species, together with *Pentastomum subuliferum*, to be "*sine dubio status imperfectus*" of Harley's *Pentastomum multicinctum* (= *Armillifer annulatus*). This, however, is wrong; Leuckart's description of *Pentastomum najæ* neither agrees with *Porocephalus subulifer*, nor with *Armillifer annulatus*. The annulation alone suffices to distinguish them: *Porocephalus subulifer* has from thirty-eight to forty annulations, *Armillifer annulatus* never more than thirty, whilst *Pentastomum najæ* presents fifty. Besides, *P. najæ* is an Oriental species, whilst the other two belong to the Æthiopian region.

Pentastomum crociduræ Parona, 1890.

Under the name of *Pentastomum crociduræ*, Prof. Corrado Parona (1890) has described a nymphal linguatulid found by Leonardo Fea in a Sooty Shrew (*Crocidura fuliginosa*), Burma.

Parona's diagnosis is as follows:—

"Body cylindrical elongate, almost truncated anteriorly, slightly tapering towards the posterior extremity. Colour yellowish white, darker in the anterior portion for about 4 mm. from the cephalic extremity. Length, 10·5 mm.; maximum width, 1 mm. at anterior third of body. Body distinctly transversally pleated or divided into sixty-two regular annuli, which slightly diminish in length posteriorly. The anterior end of the body, for a space equal to about five annuli, is flattened, and bears two very short

antenuiform emiuences, or papillæ. A little below these is the mouth surrounded by a quadrangular chitinous armature, and presenting a transverse diameter of 0·112 mm. On each side of the mouth are two hook-pouches, from each of which protrudes a large and characteristic binate hook. The upper prong is smaller and straight, the lower one strongly curved and with robust point. The basal portion is wide, hut short.

Upper prong	... ...	leugth, 0·084 mm.
Lower ,,	... ...	,, 0·126 ,,
Base	... ...	width, 0·182 ,,

The body riugs are all very much alike, and bear the cutaneous pores (stigmata?) arranged transversally in two or three rows along the middle portiou of each ring, leaving therefore a wide space between the various series. The posterior extremity has a deep groove which gives it a bilobed appearance."

breadth, this species assumes a very slender appearance. In specimens only two or three lines long the anterior extremity is less swolleu and the hooks are seldom protruding, but the slit-like pouches and the mouth opening are quite visihle.

"That both large and small specimens belong to one and the same species is evidenced by the many transition forms of all sizes found by Natterer either free or encysted in the same animal, thus he found six in *Silurus piratinga* (*Piratinga filamentosa*), ahout fifty in *Silurus fasciatus* (= *Platystoma fasciatum*), ahout sixty in *Pimelodes pirarampu* (= *Pimelodus typus*), aud over a hundred in *Silurus jahu*. The cyst-enclosed peutastomes belonging to this species are never longer than two lines in the amphihious catfishes, but in other fish they may occasionally attain, whilst still in the capsule, as much as an inch in length. I was unahle to make out any sexual

Fig. 13.—*Pentastomum crociduræ*. (After Parona.)

Pentastoma gracile Diesing, 1835.

As already pointed out by Leuckart in 1860, under the name of *Pentastoma gracile*, Diesing (1835) grouped a number of immature linguatulids collected by Natterer from all kinds of South American birds, crocodiles, lizards, snakes and fishes, and no doubt representing different species and genera. Later, however, separate species were described by Leuckart, Leidy, Chatin, Parona, von Linstow and Wheeler.

In 1835, Diesing gave the following diagnosis:—

"*Pentastoma gracile*.

"P. corpore subcyliudrico, transversim annulato, plicato, capite obtuso clavato, apice caudali integro; ore suborhiculari iufero, foveis linearibus integris cuneatim dispositis, hamulis subaequalihus."

Further he adds:—

"This species measures from two lines to over an inch in length and, in proportion, from one-third to half of line maximum width at the head and one-quarter to one-third of line at the posterior extremity. The body is cylindrical, slightly flattened at the thicker anterior end, narrower at the posterior extremity, of an opaque yellowish-white colour, and surrounded throughout hy equidistant rings produced by epidermic folds. These folds do not disappear even in the largest specimens, but they are sharper and narrower in the smaller ones. The anterior end is rounded and curved towards the ventral side; beneath the border are four rent-like openings disposed in the form of a cone. From each one of these cavities there protrude two orange-coloured, curved hooks of ahout the same size, geminate and surrounded at their base hy a rough covering. Between the two lower hook-pairs is the almost circular mouth openiug. Besides the respiratory pores surrounding each ring, one can distinguish below the mouth four wart-like protuberances: two ahove the first hody ring aud two on the third ring, below the others forming almost a square. Two other similar protuberances are at the apex of the head, and similar ones are placed on the sides of the dorsal aspect of the head in the form of a cluh; these latter ones are by far the largest and more prominent. The body tapers gradually towards the slightly bluut and generally inwardly curved posterior extremity. Owing to this gradual tapering of the body and to the proportion of length to differentiation from the exterual characters. Possibly this may be indicated hy the frequently incurved posterior extremity, but it needs further investigation."

In 1850, Diesing gives the following revised diagnosis:—

"Corpus subcylindricum aunulato-plicatum. Caput clavatum. Os suborhiculare inter bothria in forman coni apice truncati disposita situ hamulis subaequalihus Lougit. feminae 2-12″; erass. antice ¼-½″; postice ¼-⅓″."

In 1835, Diesing gave the following list of hosts:—

Podinema teguixin (= *Tupinambis teguixin*), *Podinema* u. sp., *Bothrops jararaca* (= *Lachesis lanceolatus*), *Elaps* n. sp., *Pseuderys* n. sp. (= *Pseudoeryx* n. sp.), *Tropidonotus* n. sp., *Coluber* (?) n. sp., *Eunectes scytale* (= *Eunectes murinus*), *Salmo saua* (?), *S. auratus* (?), *Salmo erythrophthalmus* (?), *S. tamuco* (?), *Serrosalmo piranha* (= *Serrasalmo piraya*), *Erythrinus trahira* (= *Macrodon trahira*), *Silurus jahu*, *S. gerupoca*, *S. piratinga* (= *Piratinga filamentosa*), *S. megacephalus* (= *Pimelodus ornatus*), *S. fasciatus* (= *Pseudoplatysoma fasciatum*), *S. vituga* (= *Pimelodus vituga*), *S. pintado* (?), *Pirarara bicolor* (= *Phractocephalus hemiliopterus*), *Pimelodes pirarampu* (= *Pimelodus typus*), *Sternarchus albifrons*, *Clupea tobarana* (?), *Raja motoro* (= *Taeniura motoro*), *Gymnotus carapo* (= *Carapus fasciatus*), *Gymnotus electricus*, *Gymnotus* n. sp. *Synbranchus marmoratus*, *Synbranchus* u. sp., *Lobotes monoculus*.

In 1850, the following new hosts were added:—

"*Ardea cocoi*, *Cloelia fasciata* (?), *Elaps lemniscatus*, *Helicops tschudii* (= *Elaps tschudii* ?), *Pseuderys plicatilis* (= *Diamades plicatilis* ?), *Podinema nattereri* (= *Mabuia frenata* ?), *Carapus brachiurus* (= *Carapus fasciatus*), *Pellona castelnaeana* (= *Pellona flavipinnis*), *Platystoma platyrhynchus* (= *Hemisorubim platyrhynchus*), *Platystoma tigrinum* (= *Pseudoplatysoma tigrinum*), *Raphiodon vulpinus* (= *Cynodon vulpinus*), *Tetragonopterus argentatus*, *Salminus brevidens*, *Bagrus mesops* (= *Arius herzbergi*), *B. pernecus* (= *Arius herzbergi*), *Acara crassispinus* (= *Astronotus ocellatus*)."

At the same time the following hosts from the first list are omitted in the second:—

Salmo saua, *S. auratus*, *S. erythrophthalmus*, *S. tamuco*, *Silurus jahu*, *S. gerupoca*, *S. piratinga*, *S. fasciatus*, *S. pintado*, *Clupea tobarana*, *Lobotes monoculus*.

Possibly some of the new names are in lieu of these, as may be surmised from other changes in the nomenclature of the hosts that can be traced, such as:—

"*Macrodon trahira* for *Erithrinus trahira*, *Pygocentrus piraya* for *Serrasalmo piranha*, *Pimelodus megacephalus* for *Silurus megacephalus*, *Pimelodus vituga* for *Silurus vituga*, *Phractocephalus hemiopterus* for *Pirarara bicolor*, *Carapus brachiurus* for *Gymnotus carapo*, *Taeniura motoro* for *Raja motoro*, and probably *Podinema nattereri* for *Podinema* n. sp., *Pseuderys plicatilis* for *Pseuderys* n. sp., *Elaps lemniscatus* for *Elaps* n. sp., *Helicops tschudii* for *Tropidonotus* n. sp., *Cloelia fasciata* for *Coluber* n. sp."

Leuckart (1860) gives a specific diagnosis of *Pentastomum gracile* based on specimens collected from the intestine, air-bladder and "*intestinorum adipe*" of *Hydrocyon* (*Salminus*) *brevidens* forwarded by Diesing from duplicates in the Vienna Museum. He doubts whether his diagnosis is applicable to all the other forms ascribed to *P. gracile*, and fears that Diesing has gathered under the one name the young forms of several species.

Leuckart's diagnosis of *Pentastomum gracile* from *Salminus brevidens* is as follows:—

"Animalium imperfecte evolutorum corpus gracilescens, vermiforme, annulato-plicatum, ventre planiusculum. Cephalothorax clavatus, truncatus, bene distinctus. Annuli corporis numerosi (c. 90), anteriores breves, posteriores brevissimi, serrulato-dentati. Stigmata confertim aggregata, in series quatuor vel quinque alternatim positas collocata. Hamuli elongati, geminati, subaequales, accessorii cum principalibus arcte cohaerentes. Fulcrum latum, elongatum, rotundatum. Longit. 11 mm., lat. 1·7 mm. Habitat in piscibus et amphibiis diversis Brasiliae, folliculo inclusum. Status perfectus hucusque ignotus."

Leidy (1856) describes under the name of *Pentastomum gracile* certain tongue-worms found by Jos. Jones in the stomach of the Alligator (*A. mississippiensis*). He gives the following description:—

"Body sub-clavate, incurved, most narrowed anteriorly annular, not plicated, with margins of the annuli microscopically denticulated. Head obtuse, bothria subterminal, elevated each with two hooks, of which the upper one is the smaller. Mouth elevated, conical, in the focus of the semicircle formed by the bothria. Length from three to four lines, breadth one-third of a line."

Diesing (1864) agrees with Leuckart that under the name of *Pentastomum gracile* he probably confounded the immature forms of several species.

In 1882, under the name of *Pentastoma oxycephalum*, M. Joannes Chatin describes some immature forms of a linguatulid collected from the liver of the Alligator (*Alligator mississippiensis*). The liver was literally crammed with immature linguatulids, not encysted, but moving freely and actively in its substance. The parasites were of a greyish-white colour, and measured on an average, 9 mm. in length by 0·9 mm. in breadth. Their body presented about eighty rings. Each segment or ring bore a single row of stigmata regularly placed on the same line and fairly equidistant; and at the posterior margin a fringe of very minute spines composed of a comparatively large and rounded basal portion and of a slender rod with sharp point often slightly curved. The posterior extremity was slightly attenuated and rounded. The head was somewhat depressed and terminated anteriorly by an excavated pad, on which rested the first pair of hooks. Below these is a depression separating them from the second pair of hooks. Whilst the first pair is entirely external, the second

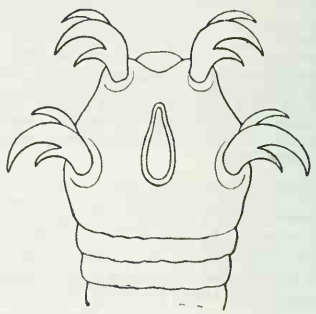


FIG. 14.—Anterior extremity of "*Pentastoma oxycephalum*." (After Chatin.)

may be called peristomial, because it is placed on a line passing through the middle of the mouth opening.

"The hooks consist of a basal portion penetrating deeply into the surrounding tissues and giving attachment to the muscles concerned in their movement. At their upper part can be seen three recurved points or blades of unequal strength. One of these, which may be looked upon as the centre of the system, is powerful and curved downwards; it has a wide base and a free extremity equally well developed. Above this blade projects a more slender one, only very slightly bent; extending at first in an upward direction, it bends slightly downwards in its terminal portion. Its base is narrow and extends to the inner border of the hook by a ridge hardly prominent. The third blade is found beneath the principal one; strongly recurved, terminating in a sharp point, it extends downwards and inwards. This last blade owing to its lower situation and inward orientation, is easily hidden by the surrounding teguments and tissues, and may be taken for a mere apophysis or "guard" such as is seen in the hooks of cesstodes.

"The hooks of this linguatulid cannot possibly be described as supplementary, geminate or double. The hooks, perfectly simple in their basal or somatic portion, end at their free extremity with three movable blades. They are distributed into two pairs of equal importance.

"The mouth opens on the ventral surface at some distance from the anterior extremity; it has the appearance of an antero-posterior slit. The four hooks surround it, but the mouth is not exactly in the middle of the space they enclose. Its anterior pole protrudes a little from between the anterior hooks, whilst its posterior pole descends considerably below the base of the posterior hooks. The outline of the oral opening is limited by a solid and slightly raised border. This frame is of chitinous nature, presents considerable resistance, and gives attachment to peri-stomial muscles."

Professor Corrado Paroua (1891) describes a specimen of *Pentastomum gracile* found by Signor A. Perugia in a fish (*Macrodon trahira* Spix) from the Plate River, S. America. His description translated reads as follows:—

"The specimen was found free in the peritoneal cavity. It measures 19 mm. in length, the width corresponding

to Diesing's measurements: 0·75—1·22 mm. in the anterior portion, 0·56—0·75 in the posterior.

"The head, well described by Diesing, presents the two pairs of hooks, but these are not figured by Diesing in his Plate IV. The hooks, of yellowish colour, are geminate and symmetrically placed, two on the right and two on the left of the mouth opening. They consist of a triangular basal-portion, set in the body and bearing on the external side large muscular bundles, and of two dissimilar hooks; the lower one larger, more recurved, the upper one straight and fashioned like a simple spine.

Basal portion	0·070
Length of upper hook	0·084
Length of lower hook	0·112

stated by Diesing. They are irregularly distributed and occupy the whole area of the ring. These stigmata are raised in the shape of a truncated cone and are supported by a very delicate chitinous skeleton."

Parona claims to be the first to describe the denticulation of the posterior ring-margins and to find several rows of stigmata in *Pentastomum gracile*, but the minute denticles which fringe the posterior margins of the body rings in certain larval forms (*Linguatula*, *Sebekia*, *Raillietiella*), had been described already in this group of tongue-worms by Leidy in 1856, and Leuckart, in 1860,

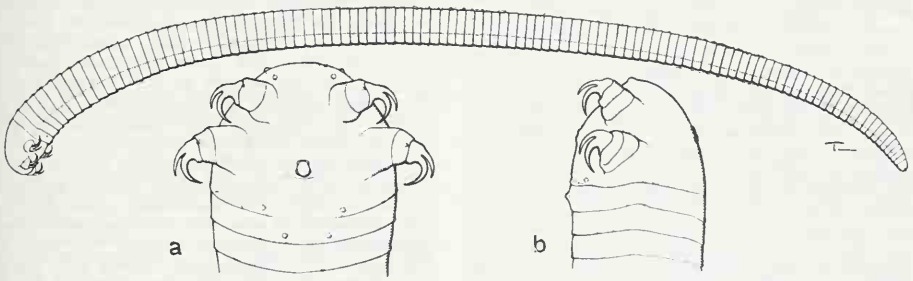


FIG. 15.—*Pentastoma gracile* (probably young form of *Leiperia cincinnalis*) from *Crocodilus niloticus*. (*a*) Anterior extremity, ventral aspect. (*b*) Anterior extremity, side view.

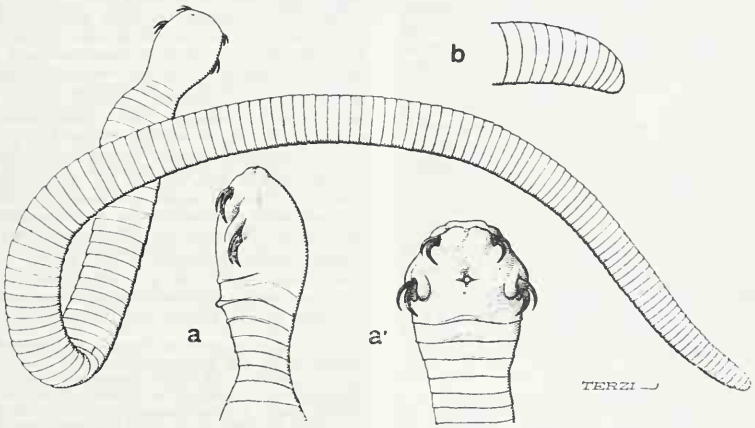


FIG. 16.—*Pentastoma gracile* from *Crocodilus niloticus?* (*a*) Anterior extremity, side view. (a^1) Anterior extremity, ventral aspect. (*b*) Posterior extremity.

"The mouth opening is situated in the middle of the space limited by the hooks; it is circular and sustained by a chitinous ring which extends below in the shape of a small conical appendix. The diameter of the mouth is 0·064 mm.

"The body rings are well marked and as described by Diesing, however, they present a very important feature which he did not observe. Each ring bears at its posterior margin a series of minute spines so very small and short that they do not even attain the diameter of one of the skin-pores. Finally, the rows of stigmatic-pores are five or six in number, and not merely one, as

had described four or five rows of stigmata in each ring for the immature linguatulid of *Salminus brevidens*, which he called *Pentastomum gracile*. The differences in the number of stigmatic rows, like those in the shape of the mouth and disposition of the hooks which present themselves when comparing Parona's drawings with those of Diesing and Leuckart, are probably due to specific differences in the tongue-worms observed. The *Pentastomum gracile* delineated in Diesing's monograph came

from a Gold-Forelle (*Salmo auratus ?*), Parona's *Pentastomum gracile* was found in *Macrodon trahira* taken from the River Plata.

Some years ago, together with the large, spiral species I have described under the name of *Leiperia cincinnalis*, Professor R. Leiper gave me a small immature linguatulid found in the lung of the same crocodile-host. A similar specimen was found in the heart of a crocodile, no doubt of the same species (*Crocodilus niloticus*), by the Rhodesian Expedition of 1907-8. Both specimens present a long, straight, slender, closely annulated body, gradually tapering caudad and terminating in a conical posterior extremity. The cephalothorax is rounded anteriorly and presents long protractile leg-rudiments disposed in trapezoid formation, and tipped with strong, geminate hooks and a small roundish mouth placed on a line with the posterior hooks. The hooks can be protended considerably, as seen in fig. 15. Leiper's specimen measures 33 mm. in length by 1·3 mm. in width, and presents 127 annulations; the Rhodesian specimen measures 35 mm. in length by 1·5 mm. in width, but shows only 106 annulations. I am inclined to believe that the small linguatulid found by Professor Leiper in the lung of *Crocodilus niloticus* is an immature form of *Leiperia cincinnalis*.

Through the courtesy of Professor Stanley Gardiner I have been able to examine Sir Arthur Shipley's collection of *Linguatulidæ*, now preserved in the laboratories of the Cambridge Zoological Museum. In it I found a few specimens of *Pentastoma gracile* from *Silurus fasciatus* (= *Pseudoplatysoma fasciatum*). These particular specimens were entirely dried up; nevertheless, it was possible to recognize in them characters very similar to those seen in the nymphal linguatulid from the Nilotic Crocodile. The descriptions and drawings of *Pentastoma gracile* given by Diesing, Leuckart and Parona also agree with the above. Therefore, taking into consideration all the information I have been able to collect, I believe that, under the name of *Pentastoma gracile*, we have a number of immature forms of tongue-worms belonging to different genera (*Sebekia*, *Leiperia*, &c.) of the *Sebekini* section of the *Porocephalinæ*.

Pentastomum lari Mégnin, 1883.

In his article on "*Pentastomida*," contributed to "The Cambridge Natural History," Sir Arthur Shipley gives a list of species known up to 1909, in which he places Mégnin's *Pentastomum lari* and Ward's *Reighardia* sp. as different species and wide apart. No doubt we shall discover other species of the genus *Reighardia*, but, so far, only one species has been described, and that species is *Reighardia sternæ* Diesing, which includes not only the specimens collected by De Filippi in Italy from the air-sacs of the Common Tern (*Sterna hirundo*), but also Mégnin's *Pentastomum lari* collected by Prof. Pouchet in Lapland from the Glaucous Gull (*Larus glaucus*) and those collected by Prof. Henry B. Ward in the great Lake District of North America from the Common Tern and from Bonaparte's Gull (*Larus philadelphia*). The identity of species for all these specimens I consider very probable, not only because of likeness in morphological and anatomical characters (so far as they have been described), but, chiefly, on account of zoogeographical data. All the above-mentioned hosts of *Reighardia* belong to the same family (*Laridæ*) of widely distributed sea birds; some of them (*Larus glaucus, Sterna hirundo*) are found both in Europe and America, and one, the Burgomaster, or Glaucous Gull, is essentially an Arcatlantic form. In 1913, Drs. Gomes de Faria and Lauro Travassos found a *Reighardia* in the air-sacs of the Dominican Gull (*Larus dominicanus*) shot in the Bay of Rio de Janeiro, but they gave no description, considering it to be "*Porocephalus lari* (Mégnin)."

Professor Filippo De Filippi (1861) discovered this linguatulid near Turin, Italy, in the left air-sac of a Common Tern (*Sterna hirundo*). He found a single specimen 39 mm. long with body cylindrical, transparent and annulation effaced. Owing to its dark colour, the intestine could be seen quite clearly by transparency. The body was distended by the fully mature ova, which contained an acariform embryo provided with three pairs of legs devoid of claws. Being unable to detect any hooklets on the adult female parasite, Prof. De Filippi surmised that the head must have been severed from the body and, indeed, he states that he found a small round body with a single hooklet in the right air-sac which he thought might have been the part missing. It is, however, more likely that the poorly developed hooks escaped his observation. In this species the anterior end of the body being more slender and acuminate is easily mistaken for the tail end. Owing to the peculiar characters of the embryo, Professor De Filippi suggested that this parasite might represent a new genus.

Leuckart (1860), at p. 150 of his monograph, mentions seeing the embryos of this species in ova sent him by De Filippi, and says:—

> "They represented a developmental stage intermediate between those (of *Linguatula serrata*) drawn by me in figs. 9 and 10 of pl. III. Therefore (taking into consideration my experience of *Pentastomum tænioides* and *oxycephalum*), I should consider that the parent animal was not yet fully developed. The feet-extremities were still hookless, but very prominent and, strange to say, not two but three on each side. The dorsal surface of the embryo presented a conical appendage distinctly open above. This structure evidently represents the dorsal plug drawn in fig. 9, and, as I have since ascertained, it is also open at the same stage in *Pentastomum tænioides*."

Diesing (1864), under the name of *Pentastomum sternæ hirundinis*, gives the following diagnosis:—

> "Corpus cylindricum exannulatum; nec bothria nec uncinuli bothriorum observata. Longit. 1″ 8‴.
>
> "Embryones ovulis desumti pedicellis utrinque tribus uncinulis nullis praeditis, instructi.
>
> "Habitaculum. *Sterna hirundo:* in cavo thoracis in sacculo aereo, rarissime Augustae Taurinorum (Filippi)."

This diagnosis is preceded by the following note:—

"Num vermis cujus descriptio sequitur, pro typo generis proprii Proctuchorum in sectione Paramecocotyleorum, num pro typo generis proprii et simul tribus Proctuchorum in sectione Cyclocotyleorum, hactenus solummodo supposito, habendus sit, adhuc incertum."

The year after, in his "*Revision der Cephalocotyleen*," Diesing places this species in a separate and new family, the family *Hypocotylea* of the *Cyclocotylea protucha*.

Mégnin (1883) describes this species under the name of *Pentastoma lari* from specimens collected by Prof. Pouchet in Lapland from the air-sacs of the Burgomaster (*Larus glaucus*). He gives the following description:—

"From the air-sacs of the great gull of the polar seas (*Larus glaucus*), M. Pouchet has collected a dozen specimens of a very curious vermiform parasite, the majority 6 cm. long, other smaller ones hardly attaining 1 cm., cylindrical, with posterior extremity incurved and larger than the anterior extremity, which is somewhat attenuated in the large, more slender and straight in the small. This parasite was taken at first for a trematode, of which, indeed, it has the appearance, but a careful microscopical examination revealed at the anterior extremity two pairs of hooks symmetrically placed on each side of the mouth opening, such as are characteristic of the Pentastomes. These, however, constitute a new species which differs considerably from all Pentastomes so far described. Indeed, the extremity which carries the mouth and hooks in the large specimens—which are females replete with eggs—is more pointed than the posterior end, which is large, rounded and without visible anus. The body does not seem divided into marked rings, but rather streaked by shallow grooves resembling undulations. The anterior extremity, greatly attenuated, presents two tubercles simulating aborted antennæ, and, below, in the middle of what represents a kind of first segment, a mouth-opening of oval shape situated between the two anterior branches of a chitinous armature shaped like a cross; this mouth is ovalish, with longer diameter antero-posterior, with lip wrinkled right round. In the left angle of the chitinous oral cross is a small disc-shaped organ formed of concentric circles which may be a sucker. Between the first and second cutaneous grooves, on what may be considered as the second segment, and always posteriorly and near the edges, is a first pair of foot-claws composed of two joints, a kind of basal joint or coxa, oval, more compressed anteriorly and adhering to the teguments; in this first joint moves a tarso-claw with swollen free part composed of a tubercle anteriorly and a recurved point posteriorly. The four foot-claws and the mouth are very small and can be seen only with a magnification of 200 diameters, especially on account of the opacity of the teguments and of the tissues and other underlying elements. The intestine is very large, presents some flexuosities, and is full of a black, opaque matter, not unlike sepia. There is no trace of anus.

"In the female, which measures 6 cm. in length by 3 mm. in width, the body is filled with ova; the eggs are oval and measure 0·14 mm. in length by 0·09 mm. in width. The skin of the female is thick, wrinkled in every direction, and beset with papilliform tubercles composed of a conical stem with wide base and a large mushroom-like head; they measure from 0·01 to 0·02 mm.

"The male is hardly 1 cm. in length by 1 mm. in width, its anterior extremity is wider than the posterior, the integuments are similar to those of the female, so also the mouth and the foot-claws, which are arranged in the same way. The intestine may likewise be seen by transparency, and contains a black, opaque substance. One can also make out a testicular tube which seems to terminate near the anterior extremity behind the mouth, but there are no visible organs of copulation."

Shipley (1898) points out that though Mégnin gives 6 cm. as the length of the female, the figure of this animal "*de grandeur naturelle*" measures only about 3·5 cm. Further, the number of rings in this species is omitted from the account, but judging from the somewhat vague figure there are about 110. The body was crowded with eggs.

Professor Henry B. Ward (1899) found what he considers to be the same parasite in gulls and terns of the region of the Great Lakes in North America. In a short preliminary notice "On Reighardia, a new genus of Linguatulida," published in the *Proceedings* of the American Association for the Advancement of Science for 1899, he says:—

"In the air-sacs of gulls on Lake St. Clair was discovered in 1894 a vermiform parasite which could not be definitely placed. It occurred infrequently, and even when found was present in small numbers. The host was Bonaparte's Gull. Last year the same parasite was found in the Common Tern on Lake Erie. Here it was even rarer, only one bird in 100 being infested. One of three parasites obtained was a female containing well-developed embryos, and from their character it was easy to determine the taxonomic position of the parasite as closely related to the Linguatula. Subsequent careful study showed also the characteristic hooks of the family, yet very poorly developed. The body is elongated, cylindrical, transparent, and devoid of any annulations. The cuticula is thin, bearing around the mouth opening a chitinous framework recalling that of the Sarcoptidæ. Of its post-embryonic development nothing is known.

"Our species of Linguatula is recorded (by Mégnin) from a gull of the Arctic Ocean. This form, which is incompletely described, probably belongs to this new genus, a view strengthened by some minor details mentioned by the author."

Some weeks before his death, Professor R. Blanchard, who always took a kindly interest in my researches, sent me two immature specimens of the Burgomaster's linguatulid which had belonged to Mégnin and were labelled *Pentastomum laponica*. These specimens were in a very poor state of preservation, yet they yielded valuable information. As I have already found in the case of *Raillietiella*, an examination of the clarified specimens of the Gull's linguatulid at once revealed an exactly similar sacciform uterus opening by a narrow vaginal tube at the anterior end of the abdomen. The intestine, as described by Mégnin, is a large, somewhat sinuous tube terminating at the posterior extremity of the body. The skin is beset with stud-like projections. Thus, I found that there were good reasons for retaining Ward's genus, and I proposed dividing the family *Linguatulidæ* into two sub-families; the one, *Raillietiellinæ*, to include the genera *Raillietiella* and *Reighardia*, which are characterized chiefly by the presence of a sacciform uterus and the anterior position of the female genital opening; the other, *Porocephalinæ*, to include all other known tongue-worms, which are provided with a long, much coiled tubular uterus, and have the female sexual opening at or near to the posterior extremity of the body.

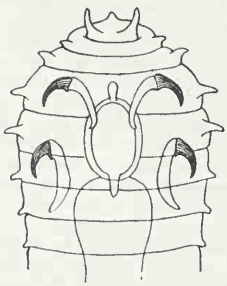
Porocephalus indicus v. Linstow, 1915.

In 1915, under the name of *Porocephalus indicus*, v. Linstow described a linguatulid found in the trachea and lungs of a Gharial (*Gavialis gangeticus*) shot near Calcutta.

V. Linstow's description of the tongue-worm is as follows:—

"Only females have been found. Rather young specimens are 20 mm. long and 2 mm. broad; behind the thin anterior end, the body is thickened and spindle-shaped, attaining a width of 1·18 mm.; behind this it contracts to a narrow neck 0·79 in diameter. Older specimens are 24 mm. long and 5 mm. in diameter; the diameter in these is nearly uniform On the ventral aspect the cuticla is transversely ringed at regular intervals of 0·44 mm., the rings occupying 3/23 of the circumference; the muscle-fibres run in four directions, transversely, longitudinally and obliquely in two directions, making equal angles with each other; the anterior and posterior ends are roundish. On the lateral edges of the rings there are posteriorly finger-shaped prolongations, which become smaller and smaller farther back, but which can be traced far backwards; exteriorly they possess an annular chitinous thickening; at the anterior end there lies beneath the cuticle an oval ring which is provided in front and behind with a prolongation, and on the right and left of it with two hooks on each side which are directed frontwards and outwards and the points of which project freely; their length is 0·15 mm. The intestinal canal opens at the posterior end; the vaginal aperture is situated closely in front of the anus; the vagina is 1·1 mm. long and 0·044 mm. wide, whilst the width of the uterus, the numerous convolutions of which fill the body cavity, amounts to 0·16 mm.; the eggs possess a thick hyaline envelope; their length amounts to 0·052 mm. on an average, their width to 0·044 mm., the yolk attaining a length of 0·026 mm. and a width of 0·016 mm."

V. Linstow's *Porocephalus indicus* is an immature linguatulid, no doubt belonging to the section *Sebekini*, which I place provisionally, for lack of more definite information, in the genus *Sebekia*.



"*Porocephalus*" *indicus* V. Linstow. (After V. Linstow.)

Porocephalus crocodili Wheeler, 1913.

In the Report of the "First Expedition to South America," Harvard School of Tropical Medicine, 1913, is mentioned a linguatulid found in the lungs of several specimens of the American crocodile (*Crocodilus americanus* Laur.) obtained from the Guayas River, Ecuador. The reporters state that:—

"In three out of four of the crocodiles examined a linguatulid of the genus *Porocephalus* was found in the lungs. In one instance the lung showed at the apex a considerable abnormal fibrosis. A nodular mass was found measuring about 5 mm. in diameter, which on section consisted of dry greyish cheesy material. On cutting in various directions through the lung, elongated and slightly flat parasites were found varying from 0·5 to 2·5 cm. in length usually, having in general a pale pink colour, with bright red and dark brown areas visible in their interior. Some of these were encysted or situated in the lung substance proper, and none were found free in the bronchi or in the vessels. The lungs of two other crocodiles were placed overnight in formalin. The following morning decomposition had already commenced. Upon dissection of all of the lungs a large number of linguatulidæ were found. Some of these were free in the bronchi and in the large air chambers. Possibly some of them had migrated after the death of the host. A number of the parasites were somewhat macerated and had lost their pink colour. The parasites were referred to William M. Wheeler, Professor of Economic Entomology in this University and in charge of the instruction in Tropical Entomology in this School, who reports that while the species is very closely related to Diesing's *Porocephalus gracilis*, it is evidently a new and undescribed one. Professor Wheeler's account of this parasite is found in the Appendix on p. 207; to it he has given the name of *Porocephalus crocodili*."

Professor Wheeler's description is as follows:—

"Among the forms described by Diesing in his well-known monograph of the Linguatulids are two South American species, called respectively *Pentastoma gracile* and *Pentastoma furcocercum*, which differ from the other species in having the hamuli, or hooks surrounding the mouth geminate, or double. These species were later transferred to the genus *Porocephalus* Humboldt when this name was substituted for *Pentastoma* Rudolphi and restricted to species having a cylindrical body, without lateral diverticula of the body cavity in each annulus. The two species described by Diesing, however, should probably constitute a distinct genus, with *Porocephalus gracile* Diesing, as the type. A third undescribed species belonging to this same group, and recently taken by the Harvard Expedition to South America from the lungs of a Crocodile (*C. americanus*) captured in the Guayas River, at Guayaquil, Ecuador, were mostly small and immature, but they included an adult male and female, and were sufficiently well preserved to enable me to draw up the following specific diagnosis.

"*Porocephalus crocodili* sp. nov.

"The specimens were from 3 to 25 mm. in length. The body is pale yellow, slender, cylindrical, blunt at the ends, usually slightly broader anteriorly, with the posterior half or third curved ventrally. The annuli are numerous, 105 in one male specimen measuring 25 mm. and 75 in a specimen measuring only 5 mm. They are very narrow, but quite sharply marked off from one another, both in large and small specimens, except at the extreme posterior end. Anteriorly the head bears a pair of small rounded sensory papillæ, and a second pair of similar but less prominent structures further apart on its dorso-lateral surface. The pores on the borders of the annular folds are very small and rather indistinct. The mouth opening is large and elliptical, or more rarely circular, as shown in Plate XLVI, fig. 1 and 3. It is surrounded by four pairs of double chitinous hooks which arise from elongated slits with welt-like margins. In each pair the posterior hook is strongly curved, the anterior distinctly more attenuate and more nearly straight. In the male the genital papilla, which is

situated in the mid-ventral line on the second annulus behind the mouth, is small but projecting.

"The specimens when found were partly free in the bronchial cavities and partly encapsuled in the lung tissue of the crocodile. They were preserved in formalin.

"*Porocephalus crocodili* is evidently very closely related to Diesing's *Porocephalus gracilis*, but this author's figures show both hooks of a pair to be equally developed and strongly curved, which is certainly not the case in *P. crocodili*. In the latter, moreover, the hooks are much smaller, less projecting and less heavily chitinized. Diesing based his species on a large number of specimens collected by Natterer at Cuyaba, Caicara and Villa Maria, Brazil. They were found either free in the body cavity or encapsuled in the viscera and mesenteries of lizards, snakes and fish. Among the lizards cited as hosts are two species of *Podinema*, among the snakes species of *Elaps*, *Coluber*, *Bothrops*, *Pseuderys*, *Tropidonotus* and *Eunectes*, and among the fish species of *Lobotes*, *Silurus*, *Piara*, *Pimelodes*, *Salmo*, *Serrosalmo*, *Clupea*, *Erythrinus*, *Symbranchus*, *Gymnotus*, *Sternarchus* and *Raja*. The other species of *Porocephalus* with double hooks (*P. furcocercum*) was also taken by Natterer at Cuyaba in the body cavity, lungs and mesentery of snakes (*Coluber* and *Spilotes*) and *Amphisbæna flavescens*. This linguatulid is readily distinguished from *gracilis* and *crocodili* by the peculiarly bifurcate posterior end of the body and the three papillæ around the base of each pair of hooks. In this case the hooks are more like those of *P. crocodili*, as Diesing says: 'Der obere ist fast gerade und kürzer, der untere länger mehr nach innen gebogen.' Had this been the case in *gracilis* Diesing could hardly have failed to call attention to the difference in his description or to show it in his figures."

Professor Wheeler considers his new species, *Porocephalus crocodili*, to be very closely related to Diesing's *Pentastoma gracile*, and thinks that *Pentastoma gracile* Dies. and *Pentastoma* (= *Raillietiella*) *furcocercum* Dies. should probably constitute a distinct genus, with *P. gracile* as the type, but, far from being related, these two species belong to different sub-families. I suspect that the specimens examined by Wheeler belonged not to one, but to two different species of *Porocephalinæ* (there were differences in the shape of the mouth, in the number of annulations). One of them was, I believe, almost certainly *Sebekia oxycephala*, described by Diesing and Leuckart from *Crocodilus americanus*, in both adult and immature stages.

Porocephalus seurati Neveu-Lemaire, 1900.

This tongue-worm was described in 1900 by Dr. M. Neveu-Lemaire from two immature specimens collected by Mr. Seurat from amongst the subcutaneous muscles of a Harlequin Snake (*Elaps fulvius*) from Guatemala.

Neveu-Lemaire's description is as follows:—

"Body cylindroid; the diameter of the body gradually tapers towards the posterior extremity.

"Cephalothorax distinct, larger than the rest of the body.

"The hooks are unequal; those farthest from the middle line or anterior are slightly smaller than the posterior ones. Between the latter pair of hooks, but somewhat below them, is the mouth. It is formed by a circular depression, at the bottom of which can be seen a chitinous framework.

"The abdomen consists of sixty rings distinctly separated from each other up to the terminal portion, which is rounded.

"Total length, 24 mm.

"Length of cephalothorax, 2 mm.

"Width of cephalothorax, 2½ mm.

"Width of middle portion, 1½ mm.

"Width of terminal portion, ¾ mm.

"Habitat: Found beneath the skin, on the surface of the muscles of an *Elaps fulvius* L. from Guatemala."

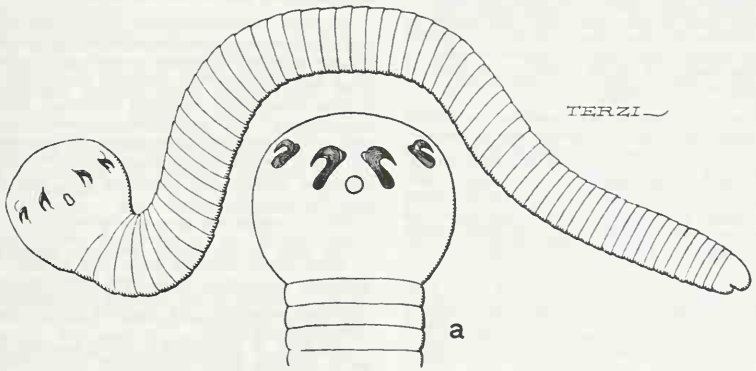


FIG. 17.—*Kiricephalus coarctatus*, young form. (*a*) Anterior extremity of *Porocephalus seurati* (*K. coarctatus*). (After Neveu-Lemaire.)

Porocephalus seurati Neveu-Lemaire is, I believe, an immature form of *Kiricephalus coarctatus*. The large rounded cephalothorax with unequal hooks, the outer slightly smaller than the inner, and mouth placed below the inner hook-line; the long cylindroid body gradually tapering to a rounded posterior extremity, and the annulation consisting of sixty (?) rings are features characteristic of *Kiricephalus coarctatus*. The drawing of the cephalo-

thorax which accompanies Neveu-Lemaire's paper is certainly typical of *Kiricephalus coarctatus*. The host in which it was found, the Harlequin Snake or Coral Snake (*Elaps fulvius*), has a wide distribution, occurring in Eastern North America, in Mexico, and Central America. Its range coincides with that of *Kiricephalus coarctatus*.

Porocephalus herpetodryados Shipley, 1905.

In 1905 (*Proc. Zool. Soc.*), under the name of *Porocephalus herpetodryados*, Professor Shipley described a tongue-worm found at the London Zoological Gardens in the lung of a Golden Tree-Snake (*Herpetodryas carinatus*) from Honduras. His diagnosis is as follows:—

"Length averaging about 10 cm., breadth 2·5 to 3 mm. in the body, in the head 4·5 to 5 mm. About 50 annuli. There are no depressions between these, or hardly any; the body is smooth, and although the segments are quite distinct, they pass smoothly into one another like the nodes of an Equisetum. The head is separated from the body by a distinct neck, which is faintly annulated, as is the posterior part of the head. The four hooks are in one straight line, and the posterior border of the oval slit-like mouth is on a line with the posterior border of the hooks. The hooks are simple; there is no accessory hooklet. There are four conspicuous papillæ just in front of the hooks.

"The presence of a distinct neck associates this species with *P. annulatus* Baird and *P. tortus* Shipley, but the neck is not so distinct from head and body as in the former, or so short as in the latter of these two species. The hooks, which have no accessory hooklet, have a well-developed flange as in *P. subuliferus* Leuckart and many others. The hooks are strongly curved, and under the microscope not very sharp. The head is rounded dorsally and flattened ventrally; it slopes down gradually to the neck."

Professor Shipley's paper is illustrated by a good drawing, which shows at a glance that *Porocephalus herpetodryados* is Diesing's *Pentastomum proboscideum* var. *coarctatum* (= *Kiricephalus coarctatus*).

Porocephalus globicephalus Hett, 1915.

In 1915, Miss Mary L. Hett proposed the new specific name *Porocephalus globicephalus* for a linguatulid found in the lung of a "Moccasin snake" (*Tropidonotus fasciatus*). Her description of the parasite (a single female specimen) is as follows:—

"The length of the body is 50 mm. and the number of annulations is about 50. The hooks are simple and sharply curved. The mouth is pear-shaped with a pointed anterior end. The head is globular and divided from the body by a well-marked neck. The anus is a wide transverse slit on the terminal segment.

"This is a North-American species, but it greatly resembles the Indian species *P. pattoni* Stephens. The main points of difference are the greater number of rings, *P. pattoni* having only thirty-six; and also the position of the anus, which is more nearly terminal in *P. globicephalus*."

The host of Miss Hett's tongue-worm is the Banded Water Snake (*Tropidonotus fasciatus*), either in its typical form, which ranges from Virginia to the Gulf of Mexico, or in one of its geographic varieties, such as the variety *Sepedon*, extending from Maine and South Canada to North Carolina, Kansas and Wisconsin, or possibly, the variety *rhombifer* of New Orleans and Mexico. As a popular name for this snake Miss Hett uses the term Moccasin, which, though sometimes applied to it, really belongs to a deadly pit-viper, the Cotton Mouth Snake (*Ancistrodon piscivorus*), with which it is often confounded.

In suggesting a new specific name for this linguatulid of the Banded Water Snake, Miss Hett ignored the fact that this tongue-worm had already been described by Diesing as far back as 1850, together with a closely allied Indian species (*Kiricephalus pattoni*), under the name of *Pentastomum proboscideum* var. *coarctatum*.

Pentastomum proboscideum Rudolphi.

Var. *coarctatum*. *Caput basi coarctatum subhemisphæricum, subtus planiusculum, corpus annulatoplicatum v. læve.*

Habitaculum—Coluber Lichtensteinii, in Brasilia (Natterer). *C. korros, in India orientali* (Lamar-Piquot); *in pulmonibus* M.C.V.

In 1910, having had the opportunity of examining six female specimens of this linguatulid from a Couper's Snake (*Coluber corais* var. *couperi* Holbr.) that had died at the London Zoological Gardens, I gave it specific rank and named it *Porocephalus coarctatus*. My publication, containing an excellent drawing of the parasite in question by Mr. A. Terzi, must have been known to Miss Hett because, indeed, she mentions it on the very same page of her paper.

This is what I said:—

"In 1908, Dr. J. W. W. Stephens, obviously unaware of both Lamare-Piquot's paper and Diesing's work, redescribed the Indian linguatulid from specimens found by Capt. Patton in the lungs of the Indian Rat Snake (*Zamenis mucosus*), and proposed for it the name of *Porocephalus pattoni*.

"In 1908, in examining a small specimen of Couper's snake (*Coluber corais* var. *couperi* Holbr.) that had died at the London Zoological Gardens, I found in its lung seven female specimens of a porocephalus answering Diesing's description of the linguatulid of *Drymobius bifossatus*. Later, through the kindness of Dr. Stephens, I was able to compare my specimens with those he had received from Capt. Patton, and I found that, as I had already surmised on zoo-geographical grounds, the Neotropical species differs from the Oriental one. In size, in general appearance, in the peculiar shape of the cephalothorax, in the characteristic constriction which follows it, both species appear to be absolutely identical, but, while the Oriental species does not present more than thirty-six rings, the Neotropical one has fifty to fifty-two. Here again the number of the body annulations presents a good and easily determinable specific character. I showed Dr. Stephens the part of my monograph concerning these tongue-worms, and when he read my suggestion that the Indian species named by him, *Porocephalus pattoni*, would probably also be found in South China, owing to the presence of both *Zamenis korros* and *Z. mucosus* in that region, he handed me a bottle containing specimens of the same species collected by Dr. Bell in Hong-Kong. I have also seen a specimen of this species in the collection of the Paris Museum, which was found in Luang Prabang, French Indo-China. Finally, Dr. Fülleborn sent me a photograph of three specimens in the collection of the Hamburg School of Tropical Medicine, which he states were found in an Indian snake. Thus, I have had the opportunity of examining a large number of specimens of the Oriental species from widely separated

parts of its distribution area, and I have found them all exactly alike and always presenting from thirty-four to thirty-six body rings. I hold, therefore, that the Oriental species named by Stephens, *Porocephalus pattoni*, is a valid species, and differs from the American one, which should be called *Porocephalus coarctatus*, raising Diesing's designation from varietal to specific rank."

In 1917, in the American *Journal of Parasitology*, Thesle T. Job and A. R. Cooper published under the name of *Porocephalus globicephalus* Hett the description of tongue-worms found in the respiratory tract of the American Black Snake or Black Racer (*Zamenis constrictor*). These authors are the first to describe male specimens of *Kiricephalus coarctatus*. Their description is given here in full:—

"A large black snake, *Basscanion constrictor* (Linn.), was received at the State University of Iowa in the fall of 1906 from Garrison-on-Hudson, New York. When the specimen was killed five males and five females of *Porocephalus globicephalus* Hett were found in the respiratory tract. Three males and three females were taken from the lung, and two males and two females from the dorsal body wall of the air sac.

"The females were found with the head only embedded in the lung tissue, or (those in the air sac) in the musculature of the body, where a copious hæmorrhage had been formed. The rest of the body of the parasites was free from attachments, hanging limply in the lumen of the lung or air sac. The heads of the males were not embedded in the tissues of the host, but only superficially attached to the walls of the lung or air sac by the hooks.

"The females vary from 82 to 96 mm. in length, being somewhat larger than the specimen described by Miss Hett, while the males were from 14 to 30 mm. long. The colour of the females is lemon yellow, the body wall being transparent, thus permitting easy observation of the mass of embryos and the movements of the intestine within. The male is pale cream in colour and the body wall is opaque.

"The head is globose dorsally; ventrally it is slightly concave with four sharply curved hooks at the anterior edge of the concavity, two on either side of the pear-shaped mouth. The neck is markedly constricted; the body is subcylindrical, slightly tapering to the posterior end, which is blunt; the digestive tract is seen from the dorsal side; laterally an opaque band runs the full length of the body (this becomes transparent in specimens preserved in alcohol, while the rest of the body becomes opaque). There are about fifty annulations, forty-eight to fifty-two having been counted. The digestive tract, which is gorged with blood, is readily seen in the living specimen, and may be traced in preserved ones."

In October, 1922, Von R. Heymons likewise, under the name of *Porocephalus globicephalus* Hett, published the description of two female and one male tongue-worms found in an undetermined black snake from Mexico, which, notwithstanding the popular name of *Vibora prieta* (= black viper), may have been a specimen of the aggressive and tail-vibrating American Black Snake (*Zamenis constrictor*), the range of which extends from British Columbia to California, Florida and Mexico.

Heymons' description translated reads as follows:—

"The female is remarkable on account of a large, somewhat rounded capitulum, which is sharply distinguished from the posterior body by a neck-like constriction. The whole length of the parasite is from 102 to 141 mm. The capitulum is about 6 mm. long by 7 mm. in diameter. The width of the posterior body is from 3 to 4 mm. The epistome (mouth opening 'oral papilla') is long-oval-shaped, with pointed end anterior and wider end posterior. The hooks are greatly curved and have large bases. The number of body annulations is about fifty. The posterior extremity of the body is truncated. The male is somewhat shaped like a skittle-pin, but with capitulum not sharply distinguished. The whole length is 43 mm. The number of annulations forty-six. The genital opening is placed in front of the first body ring."

As already pointed out by myself and others, Heymons notices that the female inserts her cephalothorax through the lung wall into one of the highly vascular respiratory cavities which honeycomb the ophidian lung. Within the respiratory cell the cephalothorax becomes swollen, rounded and constricted at its posterior extremity, so much so that forcible removal either separates the abdomen from the embedded cephalothorax, or tears part of the lung wall which remains attached to the parasite, forming a kind of ruff round the constricted neck-like portion. Heymons as well as Job and Cooper notice that the male does not pierce through the lung wall, but attaches itself only superficially, thus retaining freedom of movement, and its cephalothorax is neither swollen nor constricted as is that of the female.

There can be no doubt, I think, that the tongue-worms described by Diesing from *Coluber Lichtensteinii* (= *Drymobius bifossatus*); by Shipley from *Herpetodryas carinatus;* by Miss Hett from *Tropidonotus fasciatus;* by Job and Cooper from *Basscanion* (= *Zamenis*) *constrictor;* by v. Heymons from *Vibora prieta* (? *Zamenis constrictor*); and by Sambon from *Coluber corais*, are of one and the same species for which, in 1910, I proposed the specific name *coarctatus*, retaining in accordance with the rules of zoological nomenclature, the appellation suggested by Diesing in 1850.

My largest female specimen measures 115 mm. in length; this measurement is exceeded by Heymon's larger female, which attains 141 mm. I counted from fifty to fifty-two annulations. This very number fifty to fifty-two is confirmed by Job and Cooper; the others mention "about fifty." The mouth is described by all as ovate with narrower end anterior; some term it "pear-shaped." The dimensions of the cephalothorax vary slightly, and that is to be expected, considering the amount of moulding it undergoes. In my seven specimens the cephalothorax differed in all, being in some longer than broad, in others broader than long, and more or less constricted in its posterior portion.

Pentastomum colubri lineati Diesing.

Diesing, under the name of *Pentastomum colubri lineati*, and Leuckart under that of *P. colubri*, mention an immature linguatulid found by Schubart, in 1853, beneath the skin and between the muscles of *Coluber lineatus* L. Schubart gives no description of the parasite, but the host *Coluber lineatus* L. is no doubt *Aporophis lineatus*, a colubrid snake ranging throughout the Guianas, Brazil and Paraguay. In the absence of any description it is, of course, impossible to guess what kind of linguatulid Schubart found in his

South American snake, but I venture to suggest that it may have been an immature form of *Kiricephalus coarctatus*, because this tongue-worm is very widely distributed throughout the Americas, and frequently occurs in American colubrine snakes, such as *Coluber corais*, *Tropidonotus fasciatus*, *Drymobius bifossatus*, *Zamenis constrictor*, as well as in snakes belonging to other families such as the Coral Snake (*Elaps fulvius*) of Central America.

Porocephalus pomeroyi Woodland, 1920.

In 1920, Dr. W. N. F. Woodland described two tongueworms (a male and a female) collected by Mr. Pomeroy at Ilaro, S. Nigeria, from the "fore-gut" of a Black Cobra (*Naia nigricollis*). His description is as follows:—

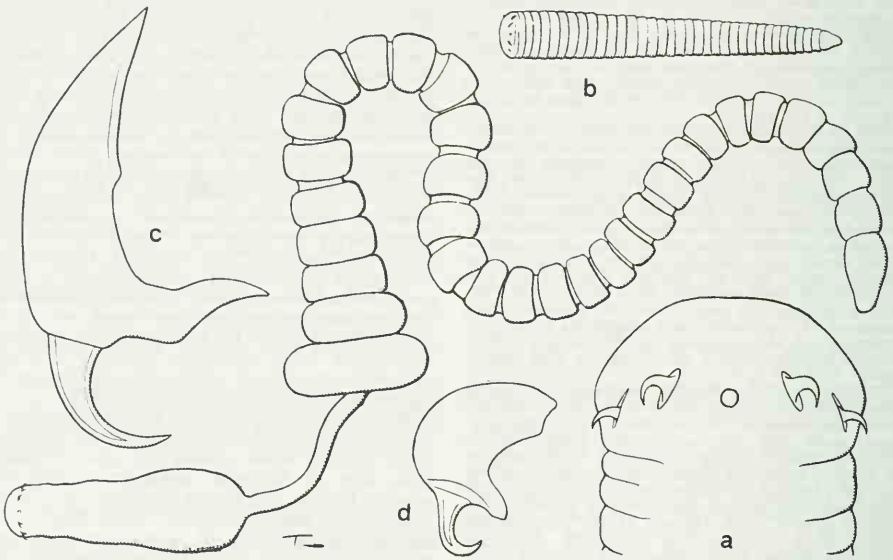


Fig. 18.—*Porocephalus pomeroyi* (*Armillifer annulatus*). (*a*) Anterior extremity. (*b*) Immature male form? (*c*, *d*) Hooks. (After Woodland.)

"Two examples. One at once attracted my attention by reason of its remarkable external form. The figure which most nearly approaches that of the present specimen is that of *Porocephalus annulatus* Baird supplied by Shipley in his memoir on the Linguatulidæ. *P. annulatus*, like the new species, has a very narrow 'neck,' but whereas in *P. annulatus* this neck is very short, in the new species it is comparatively very long. Moreover, whereas in *P. annulatus* the cephalothorax (*prosoma*) is not longer than broad (or only slightly so in some specimens), and the first annulus of the abdomen (*opisthoma*) is certainly no longer than succeeding annuli, in the new species the prosoma is roughly three times longer than it is broad, and the first annulus is at least twice the size of the third and any succeeding annulus.

"External features of a female specimen—*P. pomeroyi*. Body white, cylindrical and divided distinctly into (1) a large prosoma, (2) a long narrow 'neck,' and (3) an annulated opisthosoma. In the type specimen the entire length of the body is 64 mm. The prosoma is elongated (8 mm. in the type specimen), being one-eighth the length of the entire animal, and sac-shaped, with a maximum diameter (3 mm.) at least twice that of the opisthosoma posterior to the first two annuli. The 'neck' is nearly equal in length (7 mm.) to the prosoma, and in breadth (0·8 mm.) but little more than half the diameter of the hind portion of the opisthosoma. The opisthosoma in the type specimen consists of thirty-two annuli, including the terminal or anal 'segment.' The first annulus is much the largest, exceeding in diameter the prosoma, and in length all the succeeding annuli. The second annulus is about two-thirds the diameter of the first (slightly less than that of the prosoma) and is shorter. Succeeding annuli are smaller, and very gradually diminish in size to the posterior extremity, the terminal annuli being about two-thirds the diameter of the anterior annuli. The anal segment' is about twice as long as the penultimate annulus, though of the same diameter. The prosoma bears at its anterior end on the ventral surface the usual four chitinous hooks (curved, elongated, acute), and the small median sub-terminal mouth. Anus terminal. Habitat 'fore-gut' of Cobra (*Naja* sp. ?). Specimen preserved in the collection of the Wellcome Bureau of Scientific Research.

"I may remark that I could not observe any 'stigmata' (orifices of epidermal glands) on the surface of the skin, nor papillæ; nor could I make out the position of the female genital aperture, though, judging from appearances when the specimen was cleared in creosote, it is probably situated ventrally near the anus. The drawing of the chitinous hook was made from the creosote-cleared specimen, but the precise outline of the basal fulcrum and process was not very easy to observe. The creosote also revealed hundreds of eggs contained in the uterus, extending from the sixth annulus back to the

anus. Since it is desired to keep intact this one specimen of *P. pomeroyi* (the only specimen at present known to exist), I am unable to describe the internal anatomy.

"Features of a small male specimen of *P. pomeroyi* ? from same cobra. Entire body measured 12 mm. in length, and consisted of the small conical prosoma bearing the usual hooks and mouth, and thirty-seven annuli (not clearly indicated in figure), including the small pointed anal 'segment.' The body is slightly flattened in the region of the first ten annuli. The hooks are as shown in the figure. When cleared in creosote the specimen was seen to be a mature male. The male aperture was situated anteriorly and ventrally at the level of the third annulus.

"In general characters and in size the specimen somewhat resembles the figure of *Porocephalus aonyces* Macalister, provided by Shipley, but is probably not identical with that species, which is parasitic in the peritoneal cavity of the large Indian otter (*Aonyx cinerea*), is 17-20 mm. in length (sex supposed to be female), and has thirty annuli.

"Mr. Pomeroy remarks in his letter concerning these two specimens of Porocephalus that 'they seem to be in coitu,' a suggestion which I presume was based on the fact that they were of opposite sexes, and that they were in close proximity in the 'fore-gut' of the Cobra.

"Against the view of same species are the facts that they are of a very different shape externally, that the female has thirty-two annuli and the male thirty-seven, and that the hooks are perhaps slightly different in form. However, I think it highly probable that the two specimens are male and female of the same species. If this be so, then these two specimens present the most marked form of sexual dimorphism yet discovered in the linguatulidæ.

"*Postscript.*—Mr. Pomeroy informs me that the two specimens 'appeared to be joined together by a ligament and were not separated when I removed them from the snake.' Mr. Pomeroy encloses a rough sketch from memory of the way in which the two specimens were united, from which it would appear that a filamentous connection extended between the posterior sexual aperture of the large female and the anterior sexual aperture of the small male; this connection seems to prove that the pair belong to the same species.

"The pair were found in the intestine about the middle of the snake, and not, as I have found them before, in the first part of the fore-gut."

Dr. Woodland's description of the two specimens he had the opportunity of examining abounds in measurements, but is somewhat vague as to specific characters. Such expressions as "the prosoma bears the usual four chitinous hooks and the small median mouth," "the female genital aperture is probably situated ventrally near the anus," and "I could detect neither stigmata nor papillæ," are not likely to help one much in either recognizing, accepting, or rejecting his "new species," but, judging from the drawings which accompany his paper, I have no hesitation in declaring that the two specimens studied by Dr. Woodland are representatives of Baird's species, *Pentastomum* (= *Armillifer*) *annulatus*. The "neck," 7 mm. long, described and figured by Dr. Woodland, is only a compressed part of the body, which is found almost invariably in female specimens belonging to this species and may be longer or shorter, involving a variable number of the anterior body-rings immediately following the cephalothorax, or at a short distance from it; in the latter case the first two or three annuli are usually deformed and seem to form part of a greatly elongate cephalothorax. This peculiar compression no doubt is brought about by constriction due to the host's lung wall, which the parasite is in the habit of perforating in order to lodge its cephalothorax in one of the highly vascular alveoli within. Other linguatulids (*Kiricephalus coarctatus, K. pattoni, K. tortus, Waddycephalus teretiusculus*, &c.) behave in like manner and present more or less marked constriction behind their cephalothorax. Baird's type specimen of *P. annulatus* was actually decapitated in the endeavour to remove it from the lung in which its cephalothorax was embedded. All the specimens I have had the opportunity of examining showed a similar

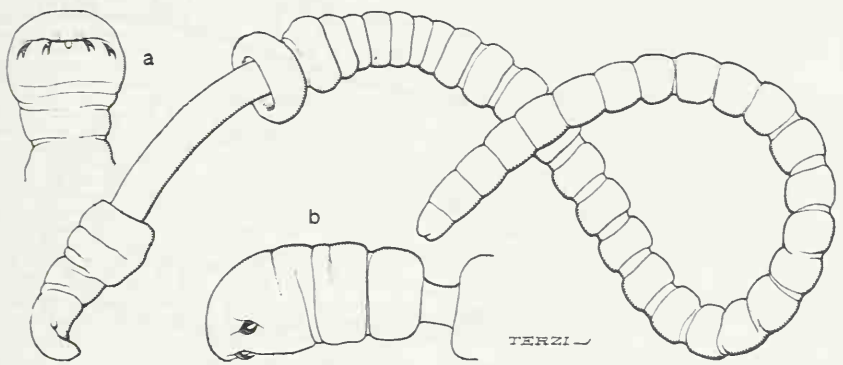


FIG. 19.—*Armillifer annulatus*, complete specimen with long "neck." (*a*) Anterior extremity of same. (*b*) Other specimen with shorter "neck."

neck-like constriction and, in one (fig. 19), the compressed part was almost as long and the proximate annuli just as deformed as in the specimen described by Dr. Woodland.

Notwithstanding Mr. Pomeroy's statement that the two specimens found by him in a Black Cobra "seemed to be in coitu," Dr. Woodland thought they might belong to two different species. The female he decided to place into a new species, for which he proposed the name of *Porocephalus pomeroyi*, and the male he thought resembled *Porocephalus aonyces* Macalister, a linguatulid (an immature form of *Armillifer moniliformis*), found by Macalister in the peritoneal cavity of the Indian otter (*Lutra nair*).

Having expressed the opinion that these connubial linguatulids might represent two different species, Dr. Woodland adds a postscript to his paper, in which he tells us that Mr. Pomeroy informs him that the two specimens were actually joined together by a ligament (no doubt the long copulatory cirri) when removed from the snake.

Had Dr. Woodland taken the trouble to look up the literature, he would neither have suspected duality of species in mere sex dimorphism, nor suggested a new specific name for a linguatulid known since 1853 and repeatedly described from fresh specimens by Baird, Harley, Leuckart, Bell, Lohrmann and Shipley.

Armillifer annulatus was first described and figured by Mr. William Baird, in 1853, from a single female specimen in the collection of Dr. Edwards Crisp. Baird proposed to call it *Pentastomum annulatum*, and gave the following diagnosis:—

"Body white, elongate-cylindrical, nearly of the same size at each extremity, strongly ringed; rings raised, about twenty-eight in number, one line distant from each other. A dark blue line runs through the whole length of the body on one side. Circumference of body five lines, length of body 2¼ in. Habitat: In the lungs of the Egyptian Cobra (*Naja haje*). Collection of Dr. Crisp."

In 1857, Dr. George Harley received four specimens of this linguatulid from D. W. Mitchell, Esq., who had found them in the lung of an African Cobra (*Naja haje*). He described their internal anatomy as well as their external characters, and suggested the name *Pentastoma multicinctum*, whilst recognizing, however, that they probably belonged to the species previously described by Baird from the same host species. He says:—

"In external characters they seem to resemble an Entozoon found in the lung of a cobra by Dr. Crisp, a short description of which was given in the *Proceedings* of the Society for 1853, p. 22, by Dr. Baird, who spoke of it as an undescribed species of *Pentastoma*, and gave it the name of *Pentastoma annulatum*. Dr. Baird's description of the species is, however, very short and unfortunately incomplete in consequence of his having seen only a small specimen, and that even imperfectly, on account of the most important fact, the head remaining imbedded and hidden from view in the lung of the snake. I think it probable, however, that the animal which he described is one of the same species as I have obtained specimens of."

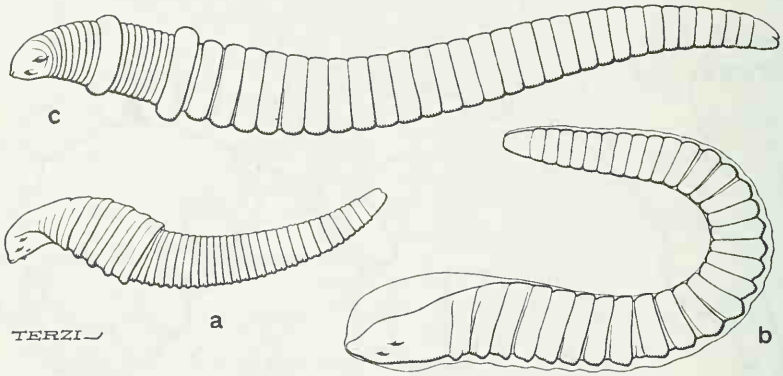


FIG. 20.—*Armillifer annulatus*.—(*a*, *b*, *c*) small immature forms.

Dr. Harley's description is as follows:—

"The body of the entozoon is of a white colour, elongated, cylindrical and strongly ringed. It begins with a rounded obtuse head, attached to the trunk by a short somewhat narrow neck. The body then gradually widens for the first three lines, where it measures in the largest specimen (4¾ in. long) eight lines in circumference, and from here down to within a few lines of the caudal extremity is almost of the same diameter as the head. The rings, which are, as before mentioned, very strongly marked, commence close to the posterior part of the head, and for the first three or four lines gradually increase in size and distance from each other. They then continue of the same relative size and distance apart (two lines) till within about half an inch of the posterior extremity, when they again, however, become smaller and more closely approximated. In all the four specimens which I examined the rings were twenty-seven in number, and where largest projected nearly half a line from the surface of the body.

"In the fresh specimen, when examined with a pocket lens, the exterior of the rings appeared mottled with

faint white-coloured spots. They were and still are quite opaque, whereas the intervening tissue is so thin and transparent that the internal viscera can be seen through it. A number of white bands or cords appear to connect one ring with another; the bands are largest in the lateral and dorsal regions. A dark-coloured line extends along the back throughout the whole length of the body; this, as I shall afterwards have occasion to show, is the digestive canal.

"On the under surface, in the centre and near to the anterior margin of the head, which is slightly flattened from before backwards, is a round foramen, the mouth. On either side of this opening are two depressions, equidistant from each other, each containing a prehensile hooklet of a bright yellow colour. These hooklets in shape closely resemble a cat's claw, which can be extended and retracted at pleasure, and when completely drawn in, the points of them can be neither seen nor felt. The obtuse posterior extremity has a deep cleft across it, and on its under surface are two openings, one in front of the other: the anterior is the entrance to the vagina, the posterior the anal aperture.

Dr. Harley believed this linguatulid to be "a true hermaphrodite," but he says:—

"I have quoted Van Beneden's description of a male Pentastoma, because in the nasal fossa of the Cobra, from which I obtained my four specimens of entozoa, I found two small Pentastomas of about $1\frac{1}{2}$ in. in length; and on dissecting one I found it to agree in every respect with Van Beneden's description of the male Linguatula. The question then occurred to me, whether or not I might look upon them as being two males and my large specimens four females of the same species. The two small entozoa found in the nasal fossa look exactly like some other Pentastoma which I obtained from the cellular tissue of a Morocco Cobra. Even taking into account the fact that the male is often much smaller than the female entozoon, their external characters and, apparently, their mode of life are so very different from those of the large worms found in the lungs, that I can scarcely believe them to belong to the same species of animal."

In 1860, Leuckart, in his "*Bau und Entwicklungsgeschichte der Pentastomen*," gave a more accurate description of this linguatulid under the name of *Pentastomum multicinctum* from specimens received from Dr. Harley (an adult female and five immature specimens, among which was a male). His diagnosis is as follows:—

"*Pent. multicinctum* Harl.

"Corpus elougatum, cylindricum, in adultis feminis transverse costatum. *Cephalothorax clavatus*, fronte rotundatus. Abdomen 27-30 annulis compositum, qui ad ultimum usque limbo praestant amplo, calloso, formam costatam supra memoratam efficiente. Stigmata dense collocata in tota fere superficie annulorum invenitur, 8-11 series retrorsum sensim diminuentes formantia. Fulcrum latum, breviusculum, postice truncatum. Longitudo feminae usque ad 94 mm., latitudo 4·5 mm. Exemplaria minora, quorum longitudo est 15-25 mm. et latitudo 1·8-2·3 mm. limbos habent annulorum vix prominentes corpusque fere integrum, annulato-plicatum. Minoribus his feminis congruit mas et forma et magnitudine. Habitat in pulmonibus *Najae hajes*."

Leuckart does not mention Baird's work on this linguatulid, neither does he mention the other species, *P. megacephalum*, described in the same paper, and figured in the Museum catalogue of Entozoa by E. Baird (1853). No doubt these papers escaped his notice.

In 1880, Mr. F. Jeffrey Bell, in an article "On the *Pentastomum polyzonum* of Harley; with a Note on the Synonymy of the Allied Species," published in the *Annals and Magazine of Natural History*, declares that the *Pentastomum multicinctum* described by Harley is identical with the *P. annulatum* of Baird. He says:—

"The author gives no technical zoological description. He does, however, give a figure of it; and as the figure was drawn by Mr. Ford, there is no need to say that it is excellent. The parasite is represented as of the natural size, i.e., 94 mm. long, and at the rings about 5 mm. wide; there are, as I count them, twenty-seven of these rings. When we compare this figure with the description and figure given by Dr. Baird, we shall, I think, be led to conclude, with Dr. Harley, that the species are identical; and we shall therefore have to regard the term multicinctum of the latter author as synonymous with the earlier term annulatus."

In 1889, Lohrmann found a nymphal porocephalus encysted in the body of a Water-hen (*Porphyrio* sp.) which, on account of the prominent body rings, he refers to *P. multicinctum*.

In 1898, Shipley mentions having seen some specimens of *P. annulatus* with twenty-six rings, "not counting the tail," taken from a Numidian Crane *Grus* (= *Anthropoides*) *virgo* in the *Musée d'Histoire Naturelle*, Paris. He further states that:—

"In a specimen of this species in the Cambridge Museum the rings, which are very distinct, number twenty-six, without the terminal joint. The head is not ringed, and is attached to the body by a very narrow neck. The mouth is very small, almost round. The fifth and sixth rings are fused with one another laterally, but this is probably abnormal. The posterior end is indented. The length is 80 mm."

I looked for the Paris specimens mentioned by Sir Arthur Shipley, but found only one. It is a male porocephalus presenting not twenty-six, but twenty-nine rings, yet it must be one of those examined by Shipley, since the label bears the following inscription: "*Grue de Numidie, Ménagerie*, 1880." Its size, shape, annulation, circular mouth, simple hooks and slit posterior extremity coincide with the well-known characteristics of *Armillifer annulatus;* it is, therefore, quite probable that, as Shipley conjectured, the linguatulid found in the Demoiselle Crane of the Paris Menagerie belongs to this species.

Some years ago I had the opportunity of examining two adult specimens belonging to the collection of the Royal College of Surgeons. They carried no information as to collector, locality, host-species, or anatomical habitat.

Specimen I.—An adult female. Body whitish (in alcohol), elongate, cylindrical, 87 mm. long by 4 mm. in maximum width, almost of the same breadth throughout, and presenting thirty strongly marked body rings. Cephalothorax club-shaped and depressed, 5 mm. long by 4 mm. wide at broadest portion. Anterior border rounded and formed by the dorsal surface which overlaps the flat ventral surface. On the latter, about half a millimetre from the anterior border, are four claw-like hooks equidistant from each other and partly retracted within their pouches. Between the two inner hooks on the line which unites their bases is

a small almost circular mouth. The posterior part of the cephalothorax presents two or three deep grooves which may represent, or merely simulate, as many body segments. The cephalothorax, or anterior portion of body, is followed by a very narrow neck-like constriction about three-quarters of a millimetre long and of a more yellowish colour. The first body ring, following immediately upon the constricted portion, measures about 2½ mm. in width, the second ring 3 mm. The following rings go on increasing slightly until they reach a width of 4 mm. about the middle of the body, then again decrease toward the posterior end until the last measures 3 mm. The rings measure slightly more than 1 mm. in thickness, and the largest project nearly 1 mm. from the body surface. They are separated by inter-annular spaces, varying from about 2 mm. in the middle part of the body to about 1 mm. at either extremity. The posterior end beyond the last body ring is conical in shape, and measures 1·8 mm. in length by 1·6 mm. in width. It is grooved or indented at its apex. The genital opening is just in front of the anus.

Specimen II.—A male, 25 mm. long by 2 mm. broad in anterior third of body and 1 mm. towards posterior extremity. It presents thirty-four rings; the posterior segment has a cleft across it.

mature linguatulid found in the peritoneal cavity of an Indian Otter (*Lutra nair*). Macalister's description is as follows:—

"These parasites measured 17 to 20 mm. in length, and were straight, elongated, acuminated, with nearly conical apex and an obtusely truncated head, which is 2·5 mm. in width. It is closely annulated with thirty rings, each of which is sharply defined and separated from its neighbours by a sharp-edged, square-profiled furrow. These rings, from being very wide (0·7 mm.) posteriorly, become very narrow in front, and cease to be distinct at the head. The mouth has two lateral chitinous lip-ridges, one on each side. The two pairs of hooks are elongated, acute, with longer basal fulcra than in *P. imperatoris* (four times the length of the exserted portion of the hook), but with a much shorter basal process. There is a single bilobed epipharyngeal nerve ganglion, and the oviduct, ovary and digestive tract are arranged on the same plan as in *P. imperatoris*.

"The surface of the skin is covered over with numerous irregularly arranged circular dots with depressed edges; these are most numerous about the head and forepart, but become fewer posteriorly. There were no ova in any forward state of development."

A rather poor drawing illustrates the paper (fig. 21).

Taking into consideration description and drawing, locality and host, I believe Macalister's *Pentastoma aonycis* to be an immature form of *Armillifer moniliformis*.

Fig. 21.—*Pentastoma aonycis*. (After Macalister.)

Quite recently Mr. Hirst has shown me two specimens of *Armillifer annulatus* from the lung of the Black-lipped Cobra (*Naja melanoleuca*), collected in Sierra Leone by Major H. Kelsall, R.A.

Pentastoma wedlii Cobbold, 1866.

In his "Catalogue of the specimens of Entozoa in the Museum of the Royal College of Surgeons of England," under the name *Pentastoma wedlii*, Dr. T. Spencer Cobbold (1866) mentions a nymphal linguatulid collected in Malacca by Mr. Wedl, who found it in the viscera of a Flat-headed Cat (*Felis planiceps*). Cobbold gives no detailed description of the parasite, but merely states that it is an encysted form presenting thirty-three annulations. Locality, host species and number of body-rings suggested that *Pentastoma wedlii* might turn out to be an immature form of *Armillifer moniliformis*, and this surmise was confirmed by an examination of the specimen. Therefore, *Pentastoma wedlii* becomes a synonym for *Armillifer moniliformis*.

Pentastoma aonycis Macalister, 1877.

At a meeting of the Royal Irish Academy, held on November 9, 1874, A. Macalister described, under the name of *Pentastoma aonycis*, an im-

Linguatula nuttalli n. sp.

Whilst correcting the proofs of this paper, I received for determination from Professor Nuttall, Director of the "Molteno Institute for Research in Parasitology," Cambridge, three specimens of a *Linguatula* found by Dr. L. Nicholl in the pharynx of a lion shot on the Kadjiado River, Magade, B.E. Africa, August, 1913.

These specimens (one male and two females), in perfect state of preservation, are strikingly beautiful on account of their accordion-like plication and opalescent translucence. They have the shape and appearance of *Linguatula serrata*, though more closely resembling the Neotropical species *Linguatula recurvata* by reason of their bifid posterior extremity. Indeed, at first sight, they might well be taken for specimens of *L. recurvata*, were it not that they belong to a different zoogeographical region and inhabit other hosts. No doubt, a careful comparative examination will reveal precise differential characters, but, so far, I have not been able to compare the new African species with any female specimens of the American one, and the published descriptions of the latter are far too vague to be of value. The Æthiopian species, like the Neotropical one, is characterized by a forked posterior extremity which seems more deeply cleft

than that of *L. recurvata*. *L. serrata* shows merely a shallow slit at the end of its conical posterior extremity. The annulation may prove useful in separating the species, but, unfortunately, very few specimens of *L. recurvata* have been examined. Diesing mentions 100-109 rings; Gomes de Faria and Lauro Travassos, who, in 1909, had the opportunity of examining eight nymphal specimens from the White-lipped Peccary (*Tayassu labiatus*), counted 112 rings. *L. serrata* is known to have about ninety rings. The number of annulations varies in the three specimens of the new African species. One of the females (42 by 8 mm.) presents about 128 rings, the other (41 by 8 mm.) only 113. The male (19 by 4 mm.) has the shape

" This species, established by Diesing in 1835 on female specimens found in the lung of the Indian Python (*P. molurus*), was later confounded with several other species. Now, owing chiefly to Sambon (1910), who has thoroughly investigated its history, we possess a more definite knowledge of *Porocephalus moniliformis*. However, until now the fully developed male of *P. moniliformis* seems to have remained unknown.

" The material at my disposal consists of numerous females and of several males collected from the lung of a *Python reticulatus* that recently died at the Berlin Aquarium.

" The acuminate conical ending of the terminal segment, the flattening of the body segments on their ventral aspect, and the rosary-like appearance described by Diesing, prove that we are actually dealing with Diesing's species. The largest females measure about 75 mm. in length; the number of distinctly visible rings varies

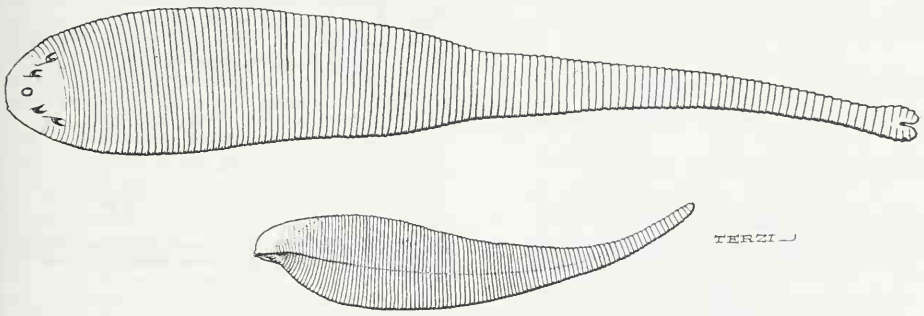


Fig. 22.—*Linguatula nuttalli*. Large specimen immature female, ventral aspect. Small specimen immature male, side view.

Fig. 23.—Fully developed male specimen of *Armillifer moniliformis*. (After v. Heymons.)

of a milkweed pod, presents 101 rings and a conical terminal segment. The mouth of *L. recurvata* is described as elliptical, that of the African species is decidedly quadrate. There seem to be differences in the size of the hooks (in the African species the outer hooks are larger than the inner ones), in the length of the narrow posterior portion, and in the general shape of the body, but, owing to paucity of material and lack of reliable information, it is not possible to make more definite statements. However, there can be no doubt that the African *Linguatula*, found by Dr. Nicholl in a lion of British East Africa, is a new species, and I propose to name it *Linguatula nuttalli* in honour of the distinguished Cambridge parasitologist, George Nuttall, who gave me the opportunity of examining it.

Fully grown males of *Armillifer moniliformis* and *Armillifer armillatus*.

In the valuable paper already referred to, Dr. v. Heymons (1922) describes the fully mature male form of *Armillifer moniliformis*. He says:—

between twenty-seven and thirty-one. The males measure from 16 to 35 mm. in length, and present twenty-nine to thirty-one rings (Sambon mentions twenty-six). In the female, the posterior corners of the flattened body rings terminate almost at right angles. In the larger males the posterior corners of the flattened ventral rings project markedly outward and assume the form of small backwardly directed denticles. Thus it happens that in the fully grown males each one of the fourteen anterior body rings is provided with a pair of lateral denticles with points directed backwards. Moreover, in these males the capitulum also is furnished with two pairs of lateral backwardly pointing denticles. These belong to the two hook-segments.

" Hitherto this tooth-like armature has escaped notice, because until now only small males had been observed (the male examined by Sambon measured 25 mm.), and in these the said peculiarity scarcely shows. It is a form of sexual dimorphism not previously described in the Pentastomids. The denticle-armature of the anterior sexually-concerned rings no doubt facilitates the peregrinations of the males within the host's lung when they go in search of the more stationary females."

Having recently obtained several male specimens of *Armillifer moniliformis* from the Philippine Islands, I am able to confirm Dr. von Heymons' observa-

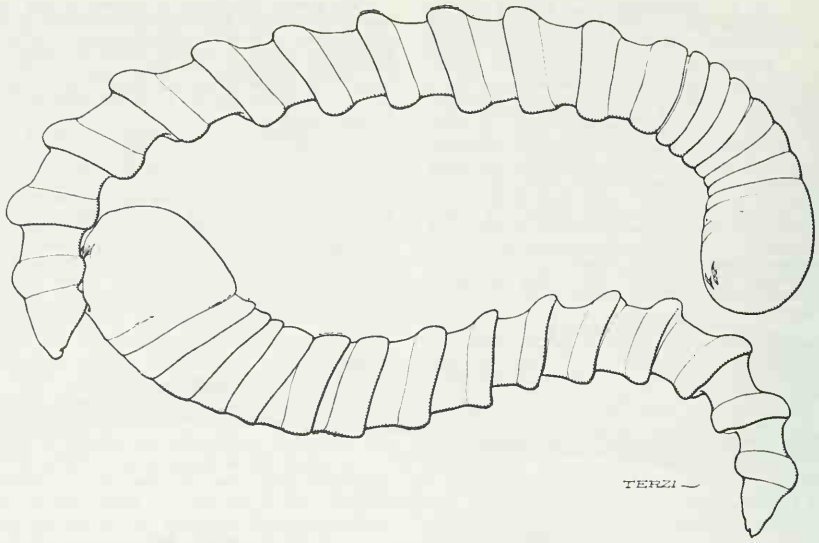
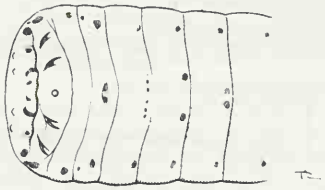


FIG. 24.—*Armillifer armillatus*, male and female, *in coitu*. (Specimens obtained by Noc and Curasson, after experimental infection of *Python sebae*, and kindly lent by Prof. Gravier, of the Paris Natural History Museum.)



Anterior extremity of a male specimen of *Armillifer armillatus* showing chitinous scutes or bosses on ventral surface.

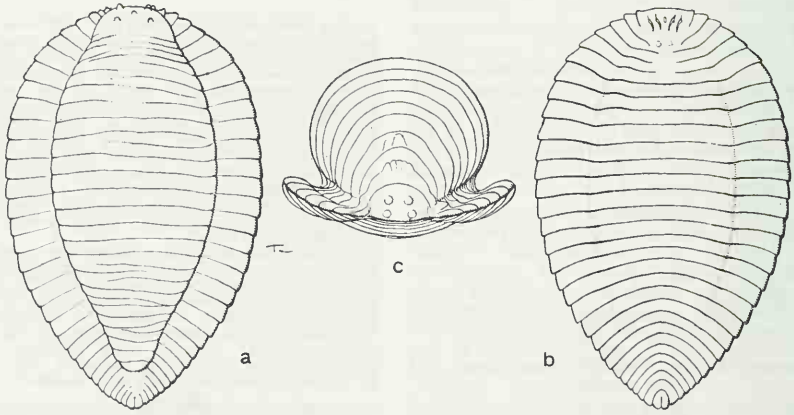


FIG. 25.—*Subtriquetra subtriquetra*. (*a*) Dorsal aspect. (*b*) Ventral aspect. (*c*) Seen from anterior end. (After Shipley.)

tion. The males I have examined came, like his, from the lung of a *Python reticulatus*. As described by the Berlin zoologist, the anterior fourteen or fifteen segments present at the ventro-lateral corners of their posterior edge conspicuous protuberant triangular barbs, so that the lateral margins of the anterior part of the flattened ventral surface are barbed like the cutting leaves of certain sedges and grasses. The points of these barbs or denticules are turned outward and caudad.

I have no male specimens of *Armillifer moniliformis* from *Python molurus* to compare with those found in *Python reticulatus*, but I suspect, from a comparison of the females, that there is at least a varietal differenee between the tongue-worms of the two Oriental species of *Python*. Judging merely from specimens in my collection,[1] the linguatulids obtained from the Indian Python are larger (76·5-110 mm.), have fewer rings (twenty-three to twenty-eight) and a shorter terminal segment. My female specimens from the Malay Python measure 62-72 mm. in length, have twenty-seven to thirty rings, and relatively longer, more acuminate terminal segment with very prominent sexual opening. The males are 20-30 mm. long, and present twenty-nine to thirty-one rings. Dr. v. Heymons' largest females measure 75 mm. in length, their rings number twenty-seven to thirty-one; the males are 6-35 mm. long, and have twenty-nine to thirty-one rings. As is well known, the two host-pythons have different distribution. *Python molurus* is found in India, Burma, Southern China, Ceylon, the Malay Peninsula and Java, but is rare in the Malay Peninsula. *Python reticulatus*, on the other hand, is very common in the Malay Peninsula and Archipelago, and extends to Indo-China and Burma. From the above morphological and distributional differences, I consider the linguatulid of the Malay Python to be a variety of the one inhabiting the Indian Python, and propose to call it *Armillifer moniliformis* var. *Heymonsi*. More abundant material, and especially a study of the male form from *P. molurus*, will decide whether it should be given specific rank.

I have a large male specimen of *Armillifer armillatus*, which presents peculiar roundish scute-like thickenings of the chitinous cutiele along the anterior border of the cephalothorax and, ventrally, at the posterior edge of the five anterior rings. Each one of these rings bears a chitin scute or boss on either side of the ventral surface and the third, fourth and fifth rings have also a few smaller ones variously placed about the middle line, as shown in the annexed figure. These thickenings are probably analogous to the denticles described by v. Heymons in the males of *Armillifer moniliformis* and serve the same purpose. However, in a copulating pair of this species, belonging to the Paris Natural History Museum and kindly lent me by Professor Gravier, the male does not present any chitinous thickenings. I annex a drawing of these linguatulids *in coitu*. They were presented to the Paris Museum by Drs. Noc and Curasson, and were obtained from the lung of a *Python sebæ* experimentally infeeted by them.

[1] Three different sets from *Python molurus*, eight specimens in all from Java and three different sets from *P. reticulatus*, twelve specimens in all; seven from the Philippines, the others from Java.

List of Linguatulidæ arranged according to their classification.

Family **Linguatulidæ.**

Sub-family RAILLIETIELLINÆ Sambon, 1922.

Genus Raillietiella Sambon, 1910.

1—*R. boulengeri* (Vaney and Sambon, 1910) Sambon, 1910.
2—*R. mabuiæ* v. Heymons, 1922.
3—*R. tetrapoda* (v. Heymons, 1922), Sambon, 1922.
4—*R. furcocerca* (Diesing, 1835) Sambon, 1910.
5—*R. geckonis* (Diesing, 1850) Sambon, 1910.
6—*R. indica* Gedoelst, 1921.
7—*R. orientalis* (Hett, 1915) Sambon, 1922.
8—*R. mediterranea* (Hett, 1915) Sambon, 1922.

Genus Reighardia Ward, 1899.

1—*R. sternæ* (Diesing, 1864) Ward, 1899.

Sub-family POROCEPHALINÆ Sambon, 1922.

Section SEBEKINI Sambon, 1922.

Genus Sebekia Sambon, 1922.

1—*S. oxycephala* (Diesing, 1835) Sambon, 1922.
2—*S. divestei* Giglioli, 1922.
3—*S. wedli* Giglioli, 1922.
4—*S. cesarisi* Giglioli, 1922.
5—*S. indica* (v. Linstow, 1906), Sambon,
6—*S. joubini* (Vaney and Sambon, 1910), Sambon, 1922.

Genus Alofia Giglioli, 1922.

1—*A. ginæ* Giglioli, 1922.
2—*A. merki* Giglioli, 1922.
3—*A. platycephala* (Lohrmann, 1889) Giglioli, 1922.
4—*A. adriatica* Hirst, 1922.

Genus Leiperia Sambon, 1922.

1—*L. cincinnalis* (Sambon, 1910) Sambon, 1922.

Genus Sambonia Noc and Giglioli, 1922.

1—*S. lohrmanni* (Sambon, 1910) Noc and Giglioli, 1922.
2—*S. wardi* (Sambon, 1910) Sambon, 1922.

Genus Diesingia Sambon, 1922.

1—*D. kachugensis* (Shipley, 1910) Sambon, 1922.
2—*D. megastoma* (Diesing, 1835), Sambon, 1922.

Section POROCEPHALINI Sambon, 1922.

Genus Porocephalus Humboldt, 1811.
1—*P. crotali* Humboldt, 1811.
2—*P. clavatus* (Wyman, 1845) Sambon, 1910.
3—*P. stilesi* Sambon, 1910.
4—*P. subulifer* (Leuckart, 1860) Stiles, 1893.

Genus Kiricephalus Sambon, 1922.
1—*K. coarctatus* (Diesing, 1850) Sambon, 1922.
2—*K. pattoni* (Stephens, 1908) Sambon, 1922.
3—*K. tortus* (Shipley, 1898) Sambon, 1922.

Genus Armillifer Sambon, 1922.
1—*A. armillatus* (Wyman, 1847) Sambon 1922.
2—*A. annulatus* (Baird, 1853) Sambon, 1922.
3—*A. grandis* " Hett, 1915," Sambon, 1922.
4—*A. moniliformis* (Diesing, 1835) Sambon, 1922.
5—*A. brumpti* Giglioli, 1922.

Genus *Waddycephalus* Sambon, 1922.
1—*W. teretiusculus* (Baird, 1862) Sambon, 1922.
2—*W. mazzai* Sambon, 1922.

Section *LINGUATULINI* Sambon, 1922.

Genus Linguatula Frölich, 1789.
1—*L. serrata* Frölich, 1789.
2—*L. recurvata* (Diesing, 1850) Railliet, 1883.
3—*L. nuttalli* Sambon, 1922.

Genus Subtriquetra Sambon, 1922.
1—*S. subtriquetra* (Diesing, 1835) Sambon, 1922.
2—*S. megacephala* (Baird, 1853) Sambon, 1922.

Immature forms of doubtful determination.

1—*Pentastomum heterodontis* Leuckart, 1860.
2—*Pentastomum naiæ* Leuckart. 1860.
3—*Pentastomum crociduræ* Parona, 1890.
4—*Pentastoma gracile* Diesing, 1835.

List of Linguatulidæ with their respective definitive hosts arranged according to regional distribution.

Oriental Region.

Raillietiella orientalis.
In *Zamenis mucosus* and *Naja tripudians.*
Both these snakes range over Transcaspia, Afghanistan, India, Ceylon, Southern China, Further India and the larger islands of the Malay Archipelago.

Raillietiella indica.
In *Bufo melanostictus.*
A toad common throughout India, Indo-China and the Malay Archipelago.

Raillietiella geckonis.
In a Siamese gecko, probably *Gecko verticillatus.*
The Verticillated Gecko inhabits India, Burma and the Malayan sub-region.

Sebekia joubini.
In *Crocodilus siamensis.*
The Siamese Crocodile inhabits Siam, Cambodia and Java.

Sebekia indica.
In *Gavialis gangeticus.*
The Gharial, or " fish-eater," inhabits the basins of the Ganges, Brahmaputra and Indus; it occurs also in the Mahanadi of Orissa and in Arakan, but does not live in the Irrawaddy, nor in the Narbada, Kisna and farther south.

Diesingia kachugensis.
In *Kachuga lineata.*
This terrapin inhabits North and Central India and Burma.

Kiricephalus pattoni.
In *Zamenis mucosus, Zamenis korros, Tropidonotus piscator, Tropidonotus stolatus* and *Plectrurus perroteti.*
These snakes are common throughout the Oriental region and its transitional areas.

Armillifer moniliformis.
In *Python molurus* and *Python reticulatus.*
The Indian Python inhabits India and Ceylon and extends to Indo-China, where, however, it is somewhat rare. The Netted Python is the commoner species in Indo-China and the Malay Islands.

Subtriquetra megacephala.
In *Crocodilus palustris.*
The Marsh Crocodile, or " Mugger," inhabits the rivers, ponds, tanks and marshes of India and Ceylon, extending westwards into Baluchistan, and eastwards through Burma and Malacca into most of the Malay islands.

Linguatula serrata.
In domestic animals of Cosmopolitan distribution.

Pentastomum crociduræ.
In *Crocidura fuliginosa.*
An Indian Musk-Shrew.

Pentastomum najæ.
In *Naja tripudians.*
The Spectacled Cobra is widely distributed, from Transcaspia to China and the Malay Peninsula and Archipelago; in the Himalayas it ascends to about 8,000 ft. above sea-level.

ETHIOPIAN REGION.

Raillietiella boulengeri.
In *Bitis arietans, Bitis gabonica, Causus rhombeatus, Psammophis sibilans.*
All these snakes inhabit Tropical Africa, and their combined distributional areas completely cover the Ethiopian region, including Southern Arabia (*Bitis arietans*), and excluding the north coast of Africa, which belongs to the Palæarctic region (Mediterranean sub-region).

Raillietiella mabuiæ.
In *Mabuia sulcata.*
This Skink inhabits South and South-West Africa.

Raillietiella sp.
In *Varanus exanthematicus.*
The Exanthematic Monitor ranges over the whole of Africa except Barbary. It is diversified into three intergrading races, one (*V. exanthematicus*) limited to the West African sub-region, another (*V. albigularis*) extending throughout the Cape sub-region, and the third (*V. ocellatus*) essentially Abyssinian.

Sebekia wedli.
In *Crocodilus niloticus.*
The Nile Crocodile ranges over the whole of Africa except the Sahara and Barbary, and is also found in Syria and Madagascar.

Sebekia cesarisi.
In *Crocodilus niloticus.*

Sambonia lohrmanni.
In *Varanus niloticus* and *Varanus exanthematicus.*
Both the Egyptian Monitor and the exanthematic Monitor range over the whole of Africa except Barbary.

Liperia cincinnalis.
In *Crocodilus niloticus.*

Porocephalus subulifer.
In *Simocephalus capensis, Naja haje* and *Bitis gabonica.*
The combined ranges of these snakes cover the whole of Tropical Africa, and extend with the Egyptian Cobra to North Africa and Palestine. *Cercopithecus callitrichus*, which has been found harbouring the nymphal form of this tongue-worm, inhabits West Africa.

Armillifer armillatus.
In *Python sebæ, Python regius, Bitis arietans, Bitis gabonica* and *Bitis nasicornis.*
The combined ranges of these snakes cover the whole of Tropical Africa. The nymphal forms of this linguatulid have been found in numerous mammals of the most sundered groups, including man.

Armillifer grandis.
In *Bitis gabonica, B. nasicornis* and *Cerastes cornutus.*
The two Puff-Adders inhabit Tropical Africa. *Cerastes cornutus* is found on the Northern border of the Sahara, in Egypt, Nubia, Arabia and Southern Palestine.

Armillifer annulatus.
In *Naja haje, Naja nigricollis, Naja melanoleuca, Bitis gabonica, Bitis nasicornis* and *Psammophis sibilans.*
The combined areas of these snakes cover Tropical Africa, and extend with the Egyptian Cobra to the countries bordering the Sahara, to Egypt and Southern Palestine. The nymphal form of this linguatulid has been found in the Demoiselle Crane (*Anthropoides virgo*) and in a Water-Hen (either *Porphyrio porphyrio* or *P. coeruleus*).

Armillifer brumpti.
In ? *Boa madagascariensis.*
This Boa inhabits Madagascar only. The nymphal form of *Armillifer brumpti* has been found in the Tenrec (*Ericulus seto-*

Linguatula serrata.
The nymphal form has been reported from imported cattle and from several African Ungulates such as the South African Blue Duiker (*Cephalopus monticola*), the North African Bubal Antelope (*Bubalis boselaphus*), and the Arabian Camel (*Camelus dromedarius*). In some of the latter probably the parasite was not *L. serrata*, but *L. nuttalli.*

Linguatula nuttalli.
In *Felis leo.*

NEOTROPICAL REGION.

Reighardia sternæ.
In *Larus dominicanus.*
The Dominican Gull ranges from the Antarctic regions to about the 10° S. lat., thus occurring in S. America, S. Africa and New Zealand.

Raillietiella furcocerca.
In *Boa constrictor, Drymobius bifossatus* and *Amphisbæna alba.*
Both the White-bellied Worm Lizard and the Common Boa are found in Tropical South America and Trinidad; *Drymobius bifossatus* is limited to Brazil and Paraguay.

Raillietiella tetrapoda.
In *Lachesis alternatus.*
The Crossed Viper inhabits Southern Brazil, Paraguay, Uruguay and Argentina.

Sebekia oxycephala.
In *Crocodilus americanus* and *Caiman sclerops.*
Both the American Crocodile and the Spectacled Caiman range throughout Central and South America.

Sebekia divestei.
In *Crocodilus americanus.*

Alofia platycephala.
Host unknown. Lohrmann suggests that it might be the Alligator.

Porocephalus crotali.
In *Crotalus terrificus.*
Crotalus terrificus ranges from Arizona, New Mexico and Texas to Southern Brazil and Northern Argentina. Nymphal form reported from numerous small mammals, but determination uncertain in the majority of cases.

Porocephalus clavatus.
In *Boa constrictor.*
The Common Boa ranges throughout Tropical South America, including the Island of Trinidad. Nymphal form has been found in *Didelphys virginiana* and *Philander philander.*

Porocephalus stilesi.
In *Lachesis mutus* and *Lachesis lanceolatus.*
The Bushmaster (*L. mutus*) is widely spread throughout Central and Tropical South America, and inhabits also Trinidad. The "Fer-de-lance" has even wider mainland range, and occurs also in Trinidad, Martinique and St. Lucia.

Kiricephalus coarctatus.
In *Drymobius bifossatus, Coluber corais, Aporophis lineatus, Herpetodryas carinatus* and *Elaps fulvius.*
The Harlequin Elaps ranges from South Virginia to Mexico and Central America. *Drymobius bifossatus, Aporophis lineatus* and *Herpetodryas carinatus* are found in Brazil and Paraguay. *Coluber corais* extends from the Southern United States to Brazil and Bolivia.

Linguatula serrata.
In imported domestic cattle, in ? *Dicotyles tajaçu* and in man (Panama, Rio de Janeiro).

Linguatula recurvata.
In *Felis onca* and *Dicotyles labiatus.*
The Jaguar ranges from Texas through Central and South America to Patagonia.

Subtriquetra subtriquetra.
In *Caiman sclerops* and *Caiman niger.*
The Spectacled Caiman ranges from Southern Mexico through Central America and Tropical South America into Argentina. The Black Caiman inhabits Tropical South America and abounds in the upper system of the Amazon.

Sambonia wardi.
In *Tupinambis teguixin.*
The Great Teju inhabits the greater part of South America east of the Andes, from Uruguay to the West Indies.

Diesingia megastoma.
In *Hydraspis geoffroyana.*
Geoffroy's Terrapin, a thoroughly aquatic species, inhabits Brazil.

Pentastoma gracile.
In many South American fishes belonging to the families: *Dasybatidæ, Lobotidæ, Cichlidæ, Ariidæ, Pimelodidæ, Characinidæ, Clupeidæ, Symbranchidæ* and *Gymnotidæ.*

Nearctic Region.

Reighardia sternæ.
In *Larus philadelphia* and *Sterna hirundo.*
Bonaparte's Gull ranges from the Gulf of Mexico to Manitoba and beyond in the interior; it is found on both the Atlantic and the Pacific coasts. The Common Tern inhabits Europe, Temperate Asia, and Temperate North America; in winter it visits India, Ceylon, South Africa and Brazil.

Raillietiella furcocerca.
In *Zamenis constrictor.*
The American Black Snake, or "Blue Racer," ranges throughout North America.

Sebekia oxycephala.
In *Alligator mississippiensis.*
The Common Alligator of the South-Eastern United States is still very abundant in certain parts of its habitat.

Porocephalus crotali.
In *Crotalus horridus, C. adamanteus* and *C. durissus.*
The combined stations of these Rattlers extend over the United States. The nymphal forms of *P. crotali* have been reported from several small mammals, but the determination is uncertain in most cases.

Kiricephalus coarctatus.
In *Zamenis constrictor, Coluber corais, Tropidonotus fasciatus, Elaps fulvius* and *Ophiobolus getulus.*
The Black Snake is found throughout North America; the Gopher Snake, or Indigo Snake, ranges from South Carolina to Florida and Mexico; the Banded Water Snake and the Harlequin Snake from Virginia to the Gulf of Mexico, including Florida; *Ophiobolus getulus* ranges over the entire United States, south of latitude 40°.

Linguatula serrata.
In a great number of wild and domestic mammals.

Linguatula recurvata.
In *Felis onca.*

Pentastoma gracile.
In *Alligator mississippiensis.*

PALÆARCTIC REGION.

Reighardia sternæ.
In *Larus glaucus* and *Sterna hirundo.*
The Burgomaster, or Glaucous Gull, ranges over the Northern and Arctic Oceans around the world.

Raillietiella mediterranea.
In *Zamenis gemonensis.*
The European Whip-Snake ranges from the Atlantic coast of Europe to South-Western Asia.

Alofia adriatica.
Host unknown, probably some fish from the Adriatic Sea.

Linguatula serrata.
In many wild and domestic mammals, including man.

AUSTRALIAN REGION.

Alofia ginæ.
Hosts unknown, probably fish. Specimens collected in Samoa.

Alofia merki.
Hosts unknown, probably fish. Specimens collected in Samoa.

Kiricephalus tortus.
In *Dipsadomorphus irregularis.*
Dipsodomorphus irregularis inhabits Celebes, New Guinea, Solomon Islands, Moluccas and Bismarck Archipelago. Specimens collected in New Britain.

Waddycephalus teretiusculus.
In *Pseudechis porphyriacus, Denisonia superba, Diemenia textilis, Diemenia psammophis* and *Notechis scutatus.*
The Australian Black Snake (*Pseudechis porphyriacus*) ranges throughout Eastern, Western and Southern Australia. The Copper-headed Snake (*Denisonia superba*) inhabits New South Wales, Southern Australia and Tasmania. The Brown Snake (*Diemenia textilis*), is found in Eastern Australia from Cape York to Victoria. The Grey Whip Snake (*Diemenia psammophis*) inhabits Australia and New Guinea. The Tiger Snake (*Notechis scutatus*) inhabits Australia and Tasmania.

Waddycephalus mazzai.
Hosts unknown, probably snakes. Specimens collected in New Guinea.

Compendium of Linguatulidæ arranged according to their hosts.

* Signifies that I have examined specimens of the parasite from the host in question.
? Signifies that the correctness of the determination is considered doubtful.

Class MAMMALIA.—Mammals.

Order PRIMATES—Man-like Mammals.
Homo sapiens—Man.
* *Armillifer armillatus.*
Armillifer moniliformis.
Porocephalus subulifer.
? *Porocephalus crotali.*
* *Linguatula serrata.*
Pan (*Anthropopithecus*) *troglodytes*—Chimpanzee.
Armillifer armillatus.
Cercopithecus patas—Patas Monkey.
Armillifer armillatus.
Cercopithecus albogularis—Sykes's Monkey
Armillifer armillatus.
Cercopithecus callitrichus—Green Monkey.
Porocephalus subulifer.
Cercopithecus tantalus—Tantalus Guenon.
* *Armillifer armillatus.*
Cercopithecus æthiops—Grivet.
* *Armillifer armillatus.*
Cercocebus fuliginosus—Sooty Mangabey.
* *Armillifer armillatus.*
Macaca fascicularis—Macaque Monkey.
* *Armillifer moniliformis.*
Macaca rhesus—Rhesus Monkey.
Armillifer moniliformis.
Papio papio—Guinea Baboon.
Armillifer armillatus.
Papio sphinx—Mandrill.
Armillifer armillatus.
Papio porcarius—Chacma Baboon.
Armillifer armillatus.
Mystax chrysopygus—Golden-rumped Marmozet.
? *Porocephalus crotali.*
Nycticebus tardigradus—Slow Loris.
Armillifer moniliformis.
Perodicticus potto—Bosman's Potto.
* *Armillifer armillatus.*

Order CHIROPTERA—Bats.
Phyllostomus discolor—
? *Porocephalus crotali.*

Order INSECTIVORA—Insect-eating Mammals.
Paraechinus æthiopicus—African Hedgehog.
* *Armillifer armillatus.*
? *Linguatula serrata.*
Hemiechinus auritus—Long-eared Hedgehog.
Linguatula serrata.
Ericulus setosus—Tenrec.
* *Armillifer brumpti.*
Crocidura fuliginosa—Sooty Shrew.
Pentasomum crociduræ.

Order CARNIVORA—Flesh-eating Mammals.
Felis leo—Lion.
Armillifer armillatus.
* *Linguatula nuttalli.*
Felis tigris—Tiger.
Armillifer moniliformis.
Felis pardus.—Leopard (African Leopard).
Armillifer armillatus.
Felis pardus—Leopard (Indian Leopard).
Armillifer moniliformis.
Felis onca—Jaguar.
Linguatula recurvata.
Felis serval—Serval.
Armillifer armillatus.

Felis planiceps—Flat-headed Cat.
* *Armillifer moniliformis.*
Felis silvestris—Wild Cat.
Linguatula serrata.
Viverricula malaccensis—Indian Civet.
Armillifer moniliformis.
Genetta pardina—Pardine Genet.
Armillifer armillatus.
Herpestes caffer—Caffer Mongoose.
Armillifer armillatus.
Atilax paludinosus—Marsh Mongoose.
* *Armillifer armillatus.*
Ariela fasciata—Banded Mongoose.
* *Armillifer armillatus.*
Proteles cristatus—Aard-Wolf.
Armillifer armillatus.
Canis familiaris—Domestic Dog.
Armillifer armillatus.
Armillifer moniliformis.
Linguatula serrata.
Canis lupus—Common Wolf.
Linguatula serrata.
Vulpes vulpes—Common Fox.
Linguatula serrata.
Lutra nair—Indian Otter.
Armillifer moniliformis.
Procyon cancrivorus—Crab-eating Raccoon.
? *Porocephalus crotali.*

Order Rodentia—Rodents.
Euxerus erythropus—Red-footed Ground-Squirrel.
Armillifer armillatus.
Cricetomys gambianus—Gambian Pouched Rat.
* *Armillifer armillatus.*
Rattus rattus—Black Rat.
Armillifer armillatus.
Linguatula serrata.
Rattus norvegicus—Brown Rat.
Linguatula serrata.
Mus musculus—House Mouse.
Porocephalus clavatus.
Oryzomys pyrrhorhinus—
? *Porocephalus crotali.*
Akodon fuliginosus—
Porocephalus crotali.
Hystrix cristata—European Porcupine.
Linguatula serrata.
Cavia porcellus—Guinea Pig.
Linguatula serrata.
Lepus europæus—Common Hare.
Linguatula serrata.
Otyctolagus cuniculus—Common Rabbit.
Linguatula serrata.

Order Ungulata—Hoofed Mammals.
Equus caballus.—Horse.
Linguatula serrata.
Bos taurus—Domestic Ox.
Linguatula serrata.
Bubalis bosephalus—Bubal Antelope.
? *Linguatula serrata.*
Cephalophus monticola—Blue Duiker.
? *Linguatula serrata.*
Cephalophus leucogaster—White-bellied Duiker.
Armillifer armillatus.
Cervicapra arundinum—Reedbuck or Reitbok.
* *Armillifer armillatus.*
Tragelaphus scriptus—Harnessed Antelope.
Armillifer armillatus.
Capra hircus—Domestic Goat.
Linguatula serrata.
Ovis aries—Domestic Sheep.
Linguatula serrata.
Antilocapra americana—Pronghorn or American Antelope.
Linguatula serrata.
Giraffa camelopardalis—Giraffe.
Armillifer armillatus.
Capreolus capreolus—Roebuck.
Linguatula serrata.
Dama dama—Fallow Deer.
Linguatula serrata.
Camelus dromedarius—Arabian Camel.
Linguatula serrata.
Phacochœrus æthiopicus—African Wart-Hog.
Armillifer armillatus.
Sus scrofa—Domestic Pig.
Linguatula serrata.
Tayassu tajacu—Collared Peccary.
Linguatula recurvata.
Tayassu labiatus—White-lipped Peccary.
* *Linguatula recurvata.*

Order Edentata—Edentates.
Tatusia peba—Peba Armadillo.
? *Porocephalus crotali.*

Order Marsupialia—Marsupials.
Philander philander—Philander Opossum.
Porocephalus clavatus.
Didelphis virginiana—Virginia Opossum.
Porocephalus clavatus.
Marmosa murina—Murine Opossum.
? *Porocephalus crotali.*

Class Aves—Birds.
Order Ardeiformes—Heron Tribe.
Ardea cocoi—Blue Heron.
? *Pentastoma gracile.*

Order Gruiformes—Crane-like Birds.
Anthropoides virgo—Demoiselle Crane.
* *Armillifer annulatus.*

Order Ralliformes—Rail-like Birds.
Porphyrio sp.—A Waterhen or Gallinule.
* *Armillifer annulatus.*

Order Lariformes—Gull Tribe.
Larus glaucus—Glaucous Gull or Burgomaster.
* *Reighardia sternæ.*
Larus philadelphia—Bonaparte's Gull.
Reighardia sternæ.
Larus dominicanus—Dominican Gull.
Reighardia sternæ.
Sterna hirundo—Common Tern.
Reighardia sternæ.

Class Reptilia—Reptiles.
Order Chelona—Turtles and Tortoises.
Kachuga lineata—
Diesingia kachugensis.
Hydraspis geoffroyana—Geoffroy's Terrapin.
Diesingia megastoma.

Order Crocodilia—Crocodiles.
Gorialis gangeticus—Gharial.
Sebekia indica.

Crocodilus niloticus—Nilotic Crocodile.
* *Sebekia wedli.*
* *Liperia cincinnalis.*

Crocodilus siamensis—Siamese Crocodile.
* *Sebekia joubini.*

Crocodilus palustris—Indian Swamp Crocodile.
Subtriquetra megacephala.

Crocodilus americanus—American or Sharp-nosed Crocodile.
* *Sebekia oxycephala.*
* *Sebekia divestei.*

Alligator mississippiensis—American Alligator.
Pentastoma gracile.
Sebekia oxycephala.

Caiman sclerops—Spectacled Caiman.
* *Sebekia oxycephala.*
Subtriquetra subtriquetra.

Caiman niger—Black or Great Caiman.
Subtriquetra subtriquetra.

Order Sauria—Lizards.

Gecko sp. (probably *Gecko verticillatus*).
Raillietiella geckonis.

Diplodactylus vittatus—
Pentastoma sp.

Calotes versicolor—Bloodsucker or Changeable Lizard.
Raillietiella sp.

Varanus niloticus—Egyptian Monitor.
* *Sambonia lohrmanni.*

Varanus exanthematicus exanthematicus—Exanthematic Monitor.
Raillietiella sp.
* *Sambonia lohrmanni.*

Varanus exanthematicus ocellatus—Ocellated Monitor.
Sambonia lohrmanni.

Tupinambis teguixin—Great Teju.
Sambonia wardi.

Amphisbæna alba—White Amphisbæna.
Raillietiella furcocerca.

Mabuia sulcata —
Raillietiella mabuiæ.

Lygosoma tæniolatum—
Pentastoma sp.

Order—Ophidia—Snakes.

Python sebæ—West African Python.
* *Armillifer armillatus.*

Python regius—Royal Python.
* *Armillifer armillatus.*

Python molurus—Indian Python.
* *Armillifer moniliformis.*

Python reticulatus—Netted Python.
Armillifer moniliformis.

Boa constrictor—Common Boa.
* *Porocephalus clavatus.*

Eunectes murinus—Anaconda.
Porocephalus clavatus.
Pentastoma gracile.

Epicrates angulifer—Pale-headed Tree-Boa.
? *Porocephalus clavatus.*

Plectrurus perroteti—
* *Kiricephalus pattoni.*

Tropidonotus piscator—Chequered Keelback.
Kiricephalus pattoni.

Tropidonotus stolatus—Buff-striped Keelback.
Kiricephalus pattoni.

Zamenis mucosus—Indian Rat-Snake.
* *Kiricephalus pattoni.*
Raillietiella orientalis.

Zamenis ravergieri—
Raillietiella boulengeri.

Zamenis gemonensis—Dark-green Snake.
Raillietiella mediterranea.

Zamenis korros—
Kiricephalus pattoni.

Zamenis constrictor—American Black Snake or Black Racer.
? *Raillietiella furcocerca.*
Kiricephalus coarctatus.

Simocephalus capensis—
* *Porocephalus subulifer.*

Drymobius bifossatus—
Raillietiella furcocerca.
Kiricephalus coarctatus.

Spilotes pullatus—South American Rat-Snake.
? *Porocephalus crotali.*

Spilotes sp.
Raillietiella furcocerca.

Coluber corais—Corais Snake.
* *Kiricephalus coarctatus.*

Coluber melanoleucus—Mexican Snake.
Raillietiella furcocerca.

Aporophis lineatus—
? *Kiricephalus coarctatus.*

Coluber sp.
Pentastoma gracile.

Xenodon merremii—
? *Porocephalus crotali* (probably *Kiricephalus coarctatus*).

Heterodon sp.
Pentastomum heterodontis.

Herpetodryas carinatus—Sipo or Golden-Tree-Snake.
Kiricephalus coarctatus.

Ophibolus getulus—Common King Snake.
* *Kiricephalus coarctatus.*

Psammophis sibilans—Hissing Sand-Snake.
Raillietiella boulengeri.
* *Armillifer annulatus.*

Dipsadomorphus irregularis—
* *Kiricephalus tortus.*

Diemenia textilis—Brown Snake.
Waddycephalus teretiusculus.

Diemenia psammophis—Grey Whip Snake.
Waddycephalus teretiusculus.

Pseudechis porphyriacus—Australian Black Snake.
Waddycephalus teretiusculus.

Denisonia superba—Copper-headed Snake.
* *Waddycephalus teretiusculus.*

Notechis scutatus—Tiger Snake.
Waddycephalus teretiusculus.

Naja tripudians—Indian Cobra.
Raillietiella orientalis.
Pentastomum najæ.

Naja haje—Egyptian Cobra.
* *Armillifer annulatus.*
* *Porocephalus subulifer.*

Naja melanoleuca—Black-lipped Cobra.
* *Armillifer annulatus.*

Elaps fulvius—Harlequin Elaps.
Kiricephalus coarctatus.

Elaps sp.
Pentastoma gracile.

Bitis arietans—Puff Adder.
* *Raillietiella boulengeri.*
* *Armillifer armillatus.*

Bitis gabonica—Gaboon Puff Adder.
* *Raillietiella boulengeri.*
* *Armillifer armillatus.*
* *Armillifer grandis.*
* *Porocephalus subulifer.*
Bitis nasicornis—Horned Puff Adder.
Armillifer armillatus.
* *Armillifer grandis.*
Causus rhombeatus—Cape Viper.
Raillietiella boulengeri.
Armillifer armillatus.
Cerastes cornutus—Cerastes Viper.
Armillifer grandis.
Lachesis mutus—Bushmaster.
* *Porocephalus stilesi.*
Lachesis lanceolatus—Rat-tailed Serpent.
* *Porocephalus stilesi.*
Lachesis alternatus—Crossed Viper.
Raillietiella tetrapoda.
Crotalus terrificus—
Porocephalus crotali.
Crotalus horridus—The Common or Banded Rattler.
Porocephalus crotali.
Crotalus adamanteus—Diamond-back Rattler.
Porocephalus crotali.
Crotalus durissus—South American Rattler.
Porocephalus crotali.

Class Batrachia—Batrachians or Amphibians.
Order Ecaudata—Frogs and Toads.
Bufo melanostictus—Black-spotted Toad.
Raillietiella indica.

Class Pisces—Fish.
Order Selachii—Modern Sharks and Rays.
Family Dasybatidæ.
Tæniura motoro—Boro, Raya Grande, Raya maça.
Pentastoma gracile.
Order Teleostei or Neichthyes—Modern Bony Fishes.
Family Lobotidæ.
Lobotes monoculus ?
Pentastoma gracile.
Family Cichlidæ.
Astronotus ocellatus—Acara-u-acu.
Pentastoma gracile.
Acara coscudo ?
Subtriquetra subtriquetra.
Order Siluridæ—Cat Fishes.
Family Ariidæ.
Arius herzbergi.
Pentastoma gracile.
Family Pimelodidæ.
Pimelodus ornatus—Mandi-Guaru, Mandi-Pimina, Cabeçudo.
Pentastoma gracile.
Pimelodus vituga ?
Pentastoma gracile.
Pirinampus typus—Mairipak.
Pentastoma gracile.
Hemisorubim platyrhynchus—Gerupoca.
Pentastoma gracile.
Pseudoplatysoma tigrinum—Tiger Fish.
Pentastoma gracile.
Pseudoplatysoma fasciatum—Tiger Fish.
* *Pentastoma gracile.*
Piratinga filamentosa—Piratinga, Pirahyba or Filhote.
Pentastoma gracile.
Phractocephalus hemiliopterus—Uarara, Io-Rai, Pirarara, Parabê-Prê.
Pentastoma gracile.
Family Characidæ.
Macrodon trahira—Trahira or Aimara.
Pentastoma gracile.
Salminus brevidens—
Pentastoma gracile.
Tetragonopterus argentatus—Sardinas.
Serrasalmo piraya—Piraya, Piranha, Cariba.
Pentastoma gracile.
Cnodon vulpinus—
Pentastoma gracile.
Family Culpeidæ.
Pellona flavipinnis—Pellona (Buenos Ayres).
Pentastoma gracile.
Family Symbranchidæ.
Symbranchus marmoratus—
Pentastoma gracile.
Family Gymnotidæ.
Gymnotus electricus—Electric Eel.
Pentastoma gracile.
Carapus fasciatus—Carapo.
Pentastoma gracile.
Sternarchus albifrons—
Pentastoma gracile.

List of Generic and Specific names with their Synonyms arranged aphabetically.

Acanthotheca Diesing, 1835 = Linguatulidæ.
Alofia Giglioli, 1922. A genus of the section Sebekini.
—— *adriatica* Hirst, 1922.
—— *ginæ* Giglioli, 1922.
—— *merki* Giglioli, 1922.
—— *platycephala* Giglioli, 1922.
Armillifer Sambon, 1922. A genus of the section Porocephalini.
—— *annulatus* Sambon, 1922.
—— *armillatus* Sambon, 1922.
—— *brumpti* Giglioli, 1922.
—— *grandis* Sambon, 1922.
—— *moniliformis* Sambon, 1922.
Cephalobæna v. Heymons, 1922 = Raillietiella.
—— *tetrapoda* v. Heymons, 1922 = *Raillietiella tetrapoda.*
Cephalobænidæ v. Heymons, 1922 = Raillietiellinæ.
Cochlus Zeder, 1803 = Linguatula.
—— *rhinarius* Rudolphi, 1805 = *Linguatula serrata.*
Diesingia Sambon, 1922. A genus of the section Sebekini.
—— *kachugensis* Sambon, 1922.
—— *megastoma* Sambon, 1922.
Distoma *crotali* Humboldt, 1808 = *Porocephalus crotali.*
—— —— *durissi* Rudolphi, 1809 = *Porocephalus crotali.*
Echinorhynchus *capræ* Braun, 1809 = *Linguatula serrata.*
—— *crotali* Humboldt, 1808 = *Porocephalus crotali.*

HALYSIS Zeder, 1803 = TÆNIA.
—— *caprina* Zeder, 1803 = *Linguatula serrata.*
HOLYSERIS De Waldheim, 1840. Misprint for HALYSIS.
HYPOBOTHRIA Diesing, 1864 = LINGUATULIDÆ.
HYPOCOTYLEA Diesing, 1864.
KIRICEPHALUS Sambon, 1922. A genus of the section POROCEPHALINI.
—— *coarctatus* (Diesing, 1850) Sambon, 1922.
—— *pattoni* (Stephens, 1908).
—— *tortus* (Shipley, 1898).
LEIPERIA Sambon, 1922. A genus of the section SEBEKINI.
—— *cincinnalis* Sambon, 1922.
LINGUATULA Froelich, 1789. A genus of the subfamily POROCEPHALINÆ.
—— *armillata* Wyman, 1847 = *Armillifer armillatus.*
—— *caprina* R. Blanchard, 1895 = *Linguatula serrata.*
—— *caviæ* De Blainville, 1828 = *Linguatula serrata.*
—— *clavata* Wyman, 1847 = *Porocephalus clavatus.*
—— *constricta* Küchenmeister, 1855 = *Armillifer armillatus.*
—— *constrictor* Galli Valerio, 1896 (misprint) = *Armillifer armillatus.*
—— *crotali* De Blainville, 1828 = *Porocephalus crotali.*
—— delle rondini di mare De Filippi, 1861 = *Reighardia sternæ.*
—— *denticulata* Rudolphi, 1805 = *Linguatula serrata.*
—— *denticulatum* Neumann, 1888. For *denticulata.*
—— *diesingii* Van Beneden, 1849 = *Armillifer armillatus.*
—— *integerrima* Frölich, 1791 = *Linguatula serrata.*
—— *ferox* Gros, 1849 = *Linguatula serrata.*
—— *lanceolata* De Blainville, 1828 = *Linguatula serrata.*
—— *nuttalli* Sambon, 1922.
—— *pinguicola* Lamark, 1816.
—— *proboscidea* Van Beneden, 1849 = *Porocephalus crotali.*
—— *pusilla* Shipley, 1898 = *Subtriquetra subtriquetra.*
—— *quadriuncinata* Mayer, 1852 = *Porocephalus crotali.*
—— *rhinaria* Raillet, 1885 = *Linguatula serrata.*
—— *rhinaris* Raillet, 1900 = *Linguatula serrata.*
—— *senata* Küchenmeister, 1857. Misprint for *L. serrata.*
—— *serrata* Frölich, 1789.
—— *subtriquetra* Raillet, 1883 = *Subtriquetra subtriquetra.*
—— *tænioides* Lamark, 1816 = *Linguatula serrata.*
—— *venarum* Lamark, 1816. Probably young *Fasciola hepatica.*
LINGUATULE moniliforme Mégnin, 1880 = *Armillifer moniliformis.*
LINGUATULINA v. Hayck, 1881. A separate order for Tongue-worms.
LINGUATULINI Sambon, 1922. A section of subfamily POROCEPHALINÆ.
NEMATOIDEUM hominis (*viscerum*) Diesing, 1851 = *Armillifer armillatus.*
ONCHOCEPHALES De Blainville, 1828 = LINGUATULIDÆ. (De Blainville was the first to place the tongue-worms into a separate order or group under this name.)
PENTASTOMA Rudolphi, 1819.
—— *annulatum* Baird, 1853 = *Armillifer annulatus.*
—— *aonycis* Macalister, 1877 = *Armillifer moniliformis.*
—— *armillata* Wyman, 1863 = *Armillifer armillatus.*
— *coarctata* Virey, 1823 = *Tænia saginata.*
—— *crociduræ* Braun, 1890 = *Pentastomum crociduræ.*
—— *denticulatum* Rudolphi, 1819 = *Linguatula serrata.*
—— *emarginatum* Rudolphi, 1819 = *Linguatula serrata.*
—— *fera* Creplin, 1829 = *Linguatula serrata.*
—— *furcocercum* Diesing, 1835 = *Raillietiella furcocerca.*
—— *gracile* Diesing, 1835.
—— *imperatoris* Macalister, 1875 = *Porocephalus clavatus.*
—— *laponica* Mégnin, 1883 = *Reighardia sternæ.*
—— *leonis* Wedl, 1863 = *Armillifer armillatus.*
—— *megacephalum* Baird, 1853 = *Subtriquetra megacephala.*
—— *megastomum* Diesing, 1835 = *Dicsingia megastoma.*
—— *moniliforme* Diesing, 1835 = *Armillifer moniliformis.*
—— *moniliforme* Mégnin, 1880. Includes *Armillifer moniliformis, Armillifer armillatus* and *Porocephalus crotali.*
—— *multicinctum* Harley, 1857 = *Armillifer annulatus.*
—— *oxycephalum* Diesing, 1835 = *Sebekia oxycephala.*
—— *oxycephalum* Chatin, 1882 = *Sebekia oxycephala.*
—— *oxycephalum* var. *minor* Wedl., 1861 = *Sebekia wedli.*
—— *proboscidea* Wyman, 1865 = *Porocephalus crotali.*
—— *proboscideum* Bresmer, 1824, includes *Porocephalus stilesi* and *Subtriquetra subtriquetra.*
—— *proboscideum* Rudolphi, 1819 = *Porocephalus crotali.*
—— *proboscideum* Diesing, 1835, includes various American species of *Porocephalus* and *Sambonia wardi.*
—— *proboscideum crocodili scleropis* Rudolphi = *Sebekia oxycephala.*
—— *proboscideum* var. *coarctatum* Diesing, 1850, includes *Kiricephalus coarctatus* and *K. pattoni.*

PENTASTOMA *proboscidium* Gottheil, 1889. Misprint for *proboscideum*.
—— *proboscoideum* Mayer, 1852. Misprint for *proboscideum*.
—— *serratum* Rudolphi, 1819 = *Linguatula serrata*.
—— *setteni* Diesing, 1850. An immature trematode extracted from the anterior eye chamber of a horse by the veterinary surgeon, van Setten, and described by Neumann (1840) under the name of *Monostomum setteni*. Diesing placed it doubtfully among the *Linguatulidæ*.
—— *subcylindricum* Diesing, 1836 = *Porocephalus crotali*.
—— *subtriquetrum* Diesing, 1835 = *Subtriquetra subtriquetra*.
—— *tænioides* Rudolphi, 1819 = *Linguatula serrata*.
—— *teretiusculum* Baird, 1862 = *Waddycephalus teretiusculus*.
—— *tornatum* Creplin, 1849 = *Armillifer moniliformis*.
—— *tornatum* Cobbold, 1879 = *Armillifer armillatus*.
—— *torquatum*.
—— *wedlii* Cobbold, 1866 = *Armillifer moniliformis*.
PENTASTOMIDA Leuckart, 1860, also Crokor, 1887 = LINGUATULIDÆ.
PENTASTOMIDÆ Leunis, 1886. A family or order to include Tongue-worms.
PENTASTOMUM Diesing, 1835.
—— *amillatum* Leuckart, 1860. Misprint for *armillatum*.
—— *annulatum* Diesing, 1864 = *Armillifer annulatus*.
—— *annulosum* Stiles, 1891 = *Armillifer annulatus*.
—— *armillatum* Diesing, 1864 = *Armillifer armillatus*.
—— *bifurcatum* Diesing, 1850 = *Raillietiella furcocerca*.
—— *cephalopi pygmæi* Cobbold, 1861 = *Linguatula serrata*.
—— *clavatum* Leuckart, 1860 = *Porocephalus clavatus*.
—— *clavatum* Lohrmann, 1889 = *Sebekia lohrmanni*.
—— *colubri* Diesing, 1864 = possibly *Kiricephalus coarctatus*.
—— *colubri lineati* Leuckart, 1860 = possibly *Kiricephalus coarctatus*.
—— *constrictum* Von Siebold, 1853 = *Armillifer armillatus*.
—— *crociduræ* Parona, 1890.
—— *denticulatum* Wagner, 1856 = Linguatula *serrata*.
—— *didelphis virginianæ* Leidy, 1852 = *Porocephalus clavatus*.
—— *diesingi* Van Beneden, in Shipley, 1898. Mistake for *Linguatula diesingii* Van Beneden.
PENTASTOMUM *euryzonum* Diesing, 1850 = *Armillifer armillatus*.
—— *fera* Guret, 1831 = *Linguatula serrata*.
—— *ferox* Van Beneden, 1857 = *Linguatula serrata*.
—— *heterodontis* Leuckart, 1860.
—— *geckonis* Diesing, 1850 = *Raillietiella geckonis*.
—— *giraffæ* Diesing, 1864 = *Armillifer armillatus*.
—— *gracile* Diesing, 1850 = Immature forms of SEBEKINI.
—— *lari* Mégnin, 1883 = *Reighardia sternæ*.
—— *leonis* Diesing, 1864 = *Armillifer armillatus*.
—— *mcgacephalum* Diesing, 1864 = *Subtriquetra megacephala*.
—— *megastomum* Leuckart, 1860 = *Diesingia megastoma*.
—— *moniliforme* Leuckart, 1860 = *Armillifer moniliformis*.
—— *multicinctum* Diesing, 1864 = *Armillifer annulatus*.
—— *najæ* Leuckart, 1860.
—— *najæ sputatricis* Leuckart, 1860 = Pentastomum *najæ*.
—— *oxycephalum* Diesing, 1850 = *Sebekia oxycephala*.
—— *oxycephalum* var. *minor* Diesing, 1864 = *Sebekia wedli*.
—— *platycephalum* Lohrmann, 1889 = *Alofia platycephala*.
—— *polyzonum* Harley, 1857 = *Armillifer armillatus*.
—— *proboscideum* Diesing, 1850 = *Porocephalus stilesi*.
—— *proboscideum* Leidy, 1856 = *Porocephalus clavatus*.
—— *proboscideum* var. *coarctatus* Diesing, 1835 = includes two species: *Kiricephalus coarctatus* and *K. pattoni*.
—— *protelis* Hoyle, 1883 = *Armillifer armillatus*.
—— *pusillum* Diesing, 1856 = *Subtriquetra subtriquetra*.
—— *recurvatum* Diesing, 1850 = *Linguatula recurvata*.
—— *senatum* Küchenmeister, 1857. Misprint for *P. serratum*.
—— *serratum* Diesing, 1850 = *Linguatula serrata*.
—— *spinulosom* Leuckart, 1860.
—— *sternæ* Diesing, 1864 = *Reighardia sternæ*.
—— *sternæ hirundinis* Diesing, 1864 = *Reighardia sternæ*.
—— *subcylindricum* Diesing, 1850 = *Porocephalus crotali*.
—— *subtriquetrum* Diesing, 1850 = *Subtriquetra subtriquetra*.
—— *subuliferum* Leuckart, 1860 = *Porocephalus subulifer*.
—— *teretiusculum* Diesing, 1864 = *Waddycephalus teretiusculus*.
—— *tornatum* Creplin, 1849 = *Armillifer armillatus*.
PENTOSTOMA *tænoides* Dick, 1840. Misprint for *Pentastoma tænioides*.

Polystoma Zeder, 1800. This genus included *Linguatula serrata* Frölich, but its type was clearly intended to be *Planaria uncinulata*.
—— *denticulatum* Rudolphi, 1808 = *Linguatula serrata*.
—— *proboscideum* Rudolphi, 1814 = *Porocephalus crotali*.
—— *serratum* Zeder, 1800 = *Linguatula serrata*.
—— *tænioidea* Nordmann, 1840. Misprint for *P. tænioides*.
—— *tænioides* Rudolphi, 1809 = *Linguatula serrata*.

Porocephalidæ v. Heymons, 1922. New family to include genera *Porocephalus* and *Linguatula*.

Porocephalinæ Sambon, 1922. New sub-family to include genera *Sebekia*, *Alofia*, *Sambonia*, *Leiperia*, *Diesingia*, *Porocephalus*, *Kiricephalus*, *Armillifer*, *Waddycephalus*, *Linguatula* and *Subtriquetra*.

Porocephalini Sambon, 1922. A section of the sub-family *Porocephalinæ*, including the four genera: *Porocephalus*, *Kiricephalus*, *Armillifer* and *Waddycephalus*.

Porocephalus Humboldt, 1811.
—— *annulatus* Shipley, 1898 = *Armillifer annulatus*.
—— *annulosus* Stiles, 1893 = *Armillifer annulatus*.
—— *aonycis* Shipley, 1898 = *Armillifer moniliformis*.
—— *armillatus* Stiles, 1893. Includes *Armillifer armillatus* and *A. moniliformis*.
—— *bifurcatus* Shipley, 1898 = *Raillietiella furcocerca*.
—— *bifurcatus* var. *mediterraneus* Hett, 1915 = *Raillietiella mediterranea*.
—— *bifurcatus* var. *orientalis* Hett, 1915 = *Raillietiella orientalis*.
—— *boulengeri* Vaney and Sambon, 1910 = *Raillietiella boulengeri*.
—— *bouvieri* Vaney and Sambon, 1910 = *Porocephalus subulifer*.
—— *clavatus* Shipley, 1898 = *Sambonia lohrmanni*.
—— *clavatus* Sambon, 1910.
—— *cercopiteci* Breinl and Hindle, 1908 = *Porocephalus subulifer*.
—— *coarctatus* Sambon, 1910 = *Kiricephalus coarctatus*.
—— *constrictus* Stiles, 1893 = *Armillifer armillatus*.
—— *crocidura* Shipley, 1898. Misprint for *P. crociduræ*.
—— *crocodili* Wheeler, 1915 = *Sebekia*.
—— *crotali* Humboldt, 1811.
—— *crotali* Shipley, 1905 = ?*Pentastomum najæ*.
—— *crotali* Stiles, 1893. Includes *P. crotali*, *P. clavatus* and *P. stilesi*.
—— *crotali* Wall, 1921 = *Kiricephalus pattoni*.
—— *geckonis* Shipley, 1898 = *Raillietiella geckonis*.
—— *gracilis* Shipley, 1898 = *Pentastoma gracile*.

Porocephalus *grandis* Hett, 1915.
—— *globicephalus* Hett, 1915 = *Kiricephalus coarctatus*.
—— *herpetodryados* Shipley, 1905 = *Kiricephalus coarctatus*.
—— *heterodontis* Shipley, 1898 = *Pentastomum heterodontis*.
—— *humboldtii* Mayer, 1852 = *Porocephalus crotali*.
—— *indicus* v. Linstow, 1906 = *Sebekia indica*.
—— *joubini* Vaney and Sambon, 1910 = *Sebekia joubini*.
—— *kachugensis* Shipley, 1910 = *Diesingia kachugensis*.
—— *lari* Shipley, 1898 = *Reighardia sternæ*.
—— *megacephalus* Shipley, 1898 = *Subtriquetra megacephala*.
—— *megastomus* Stiles, 1893 = *Diesingia megastoma*.
—— *moniliformis* Stiles, 1893 = *Armillifer moniliformis*.
—— *moniliformis* Neumann, 1899. Includes *Armillifer armillatus* and *A. moniliformis*.
—— *najæ sputatricis* Shipley, 1898 = *Pentastomum najæ*.
—— *oxycephalus* Stiles, 1893 = *Sebekia oxycephala*.
—— *pattoni* Stephens, 1908 = *Kiricephalus pattoni*.
—— *polyzonus* Stiles, 1893 = *Armillifer armillatus*.
—— *pomeroyi* Woodland, 1920 = *Armillifer annulatus*.
—— *seurati* Neveu-Lemaire, 1900 = *Kiricephalus coarctatus*.
—— *subuliferus* Stiles, 1893 = *Porocephalus subulifer*.
—— *teretiusculus* Shipley, 1898 = *Waddycephalus teretiusculus*.
—— *tortus* Shipley, 1898 = *Kiricephalus tortus*.

Porocephalum *crotali* De Blainville, 1828. Misprint for *Porocephalus crotali*.

Prionoderma Rudolphi, 1808. This genus was established for a parasite discovered by Goëtz in the stomach of *Silurus glanis*, and later adopted by Cuvier for *Linguatula*, 1817.
—— *lanceolata* Cuvier, 1817 = *Linguatula serrata*.
—— *rhinarium* Rudolphi, 1808 = *Linguatula serrata*.

Prorocephalus Weinberg. Misprint for *Porocephalus*.

Raillietiella Sambon, 1910. Type genus of sub-family Raillietiellinæ.
—— *bifurcata* var. *mediterranea* Gedoelst, 1921 = *Raillietiella mediterranea*.
—— *bifurcata* var. *orientalis* Gedoelst, 1921 = *Raillietiella orientalis*.
—— *boulengeri* Sambon, 1910. Type species of genus Raillietiella.
—— *furcocerca* Sambon, 1910.
—— *furcocerca*, Gedoelst, 1921.
—— *geckonis* Sambon, 1910.

Raillietiella *indica* Gedoelst, 1921.
—— *mabuiæ* v. Heymons, 1922.
—— *mediterranea* Sambon, 1922.
—— *orientalis* Sambon, 1922.
—— *tetrapoda* Sambon, 1922.

Raillietiellinæ Sambon, 1922. A sub-family of the family Linguatulidæ, including the genera Raillietiella and Reighardia.

Reighardia Ward, 1899. A genus of the sub-family Raillietiellinæ.
—— *cineinnalis* Sambon, 1910 = *Leiperia eincinnalis.*
—— *gracilis* Sambon, 1910 = *Pentastoma gracile.*
—— *joubini* Sambon, 1910 = *Sebekia joubini.*
—— *jubini* Sambon, 1922. Misprint for *joubini.*
—— *lohrmanni* Sambon, 1910 = *Sambonia lohrmanni.*
—— *sternæ* Ward, 1899. Type species of the genus Reighardia.

Sambonia Noc and Giglioli, 1922. A genus of the sub-family Porocephalinæ, section Sebekini.
—— *lohrmanni* Noc and Giglioli, 1922. Type species of the genus Sambonia.
—— *wardi* Sambon, 1922.

Sebekia Sambon, 1922. A genus of the sub-family Porocephalinæ, type genus of the section Sebekini.
—— *cesarisi* Giglioli, 1922.
—— *crocodili* Sambon, 1922.
—— *divestei* Giglioli, 1922.
—— *indica* Sambon, 1922.
—— *joubini* Sambon, 1922.
—— *lohrmanni* Sambon, 1922 = *Sambonia lohrmanni.*
—— *wedli* Giglioli, 1922.
—— *oxycephala* Sambon, 1922.

Sebekini Sambon, 1922. A section of the sub-family Porocephalinæ.

Subtriquetra Sambon, 1922. A genus of the section Linguatulini.
—— *megacephala* Sambon, 1922.
—— *subtriquetra* Sambon, 1922. Type species of the genus Subtriquetra.

Tænia Linnæus, 1758. Type species *Tænia solium.*
—— *capræa* Abildgaard, 1789 = *Linguatula serrata*
—— *caprina* Gmelin, 1789 = *Linguatula serrata.*
—— *lanccolata* Pilger, = *Linguatula serrata.*
—— *laneeolatum* Neumann, 1888 = *Linguatula serrata.*
—— lanceolé Chabert, 1787 = *Linguatula serrata.*
—— *rhinaria* Pilger, 1802 = *Linguatula serrata.*
—— *rhinaris* Pilger, 1803 = *Linguatula serrata.*

Tetragulus Bosc, 1811.
—— *caviæ* Bosc, 1811 = *Linguatula serrata.*

Ver rhinaris Chabert, 1787 = *Linguatula serrata.*

Waddycephalus Sambon, 1922. A genus of the sub-family Porocephalinæ, section Porocephalini.
—— *teretiuseulus* Sambon, 1922.
—— *mazzai* Sambon, 1922.

Addenda.

Porocephalus crotali Shipley, 1905, and Porocephalus crotali Wall, 1921.

In 1905 (*Proc. Zool. Soc.*), under the name of *Porocephalus crotali* Humboldt, Sir Arthur Shipley mentions adult and encysted nymphal forms of a tongue-worm found in an Indian Rat-Snake (*Zamenis mucosus*) which died at the London Zoological Gardens. He gives no detailed description, but says:—

"In the relationship of the mouth to the hooks and in the general appearance of the head they resemble *Porocephalus crotali*, but they have an unusual number of annuli, quite fifty. These annuli in the Pentastomids are obviously very variable characters, and do not correspond with any true segmentation. It has sometimes occurred to me that their number depends upon the closeness of the coil in which the larva lies. These larvæ, at any rate, were very closely coiled."

Mr. Frank Wall (1921), in his book on the "Snakes of Ceylon," which is full of valuable information on habits, food, &c., mentions also, among the parasites of the Taprobanic Ophidians, two linguatulids: *Porocephalus* (= *Kiricephalus*) *pattoni*, which inhabits the lung of *Zamenis mucosus* and "*Porocephalus crotali*" found in the body cavity of *Tropidonotus piscator* and *T. stolatus*. Of the latter species of tongue-worm he gives a drawing showing a globular cephalothorax and a tapering body with about thirty-three rings, ending in a conical extremity. Wall's "*P. crotali*" is an immature form of *Kiricephalus pattoni*. Snakes of the genus *Zamenis* are omni-carnivorous, and vary their diet of mammals and birds by preying upon other snakes, lizards and smooth-skinned amphibians. Therefore *Tropidonotus* may well be a fostering host for *Kiricephalus pattoni* and *Zamenis* a definitive host.

No more than Wall's can Shipley's linguatulid from *Zamenis mucosus* be a specimen of *Porocephalus crotali*, because the latter is a New World species limited to American Crotalines. In the absence of any description, it would be rash to guess what may have been the species seen by Shipley in the Common Rat-Snake, but there happens to be an Oriental immature tongue-worm, described by Leuckart, which long has been waiting for the discovery of its adult stage, and that is *Pentastomum najæ*. Certainly it answers to the one and only feature mentioned by Shipley, "about fifty rings," and, unlike Sir Arthur, I give considerable importance to the annulation, provided, however, one does not confound the species.

Colonial Medical Reports.—No. 129.—Hong-Kong (*contd.*).

KOWLOON AND THE NEW TERRITORIES.

Report by Medical Officer in Charge.

Kowloon-Canton Railway.

The health of the European and Chinese staff has been good throughout the year. The number of malarial cases still remains small, the presence of a medical officer at Tai Po Market being a great help in combating this disease amongst the railway staff in the New Territories.

The medical chests on the trains and workshops, &c., have been kept replenished throughout the year, and additional ones placed in the breakdown and ballast trains.

The stretcher cots which were fitted to the trains last year have proved their value, and several severe accident cases have been enabled to rest in comparative comfort during their journey to Kowloon Station. On arrival at the latter, the stretcher and patient are transferred to a wheeled ambulance from the police or disinfecting stations, all having been made of a uniform size so as to be interchangeable, thus obviating the necessity of transferring a patient from one stretcher to another. Further instruction of the guards and stationmasters in the administration of first-aid has been carried out throughout the year. I have held one examination and awarded certificates to the successful candidates. The standard attained was very good, and reflects great credit on Inspector Wynyard, who has devoted much of his leisure time to the instructiou of these men.

The Chinese staff were examined with regard to their eyesight and colour visions twice during the year.

There were four serious accidents on the railway, two of which proved fatal. One watchman at South Face Tunnel was murdered. There were a few minor accidents in addition.

The health of all ranks of the police force and their families was satisfactory throughout the year.

Kowloon and New Territories.

The number of cases of cerebrospinal meningitis showed a marked falling off, thirty cases in all beiug recorded in Kowloon as compared with 329 in 1918. They were evenly distributed throughout the year.

There were in addition thirty cases of bubonic plague and thirty-one of enteric fever as compared with thirty-four and ninety-three in 1918; the small-pox figures for the year were two, whilst in the three previous years they were 15, 173, and 100. The number of recorded cases of diphtheria was thirteen as compared with twenty-four in 1918.

The year would therefore have been a much healthier one than 1918 but for an outbreak of acute enteritis, accompanied on several occasions with acute gastritis.

In Kowloon, from August 13 onwards, we recorded 100 cases; many of these cases were clinically cholera, but the only ones returned by us as such were those in which the cholera vibrio could be demonstrated in and grown from the stools of the patient. The total number thus certified bacteriologically as cholera was eight, in which death resulted in each case.

The death-rate amongst the 100 cases of enteritis was 80 per cent.—including dumped bodies and cases diagnosed in the mortuary—but in connection with these it must be borne in mind that the vast majority of the admissions to hospital arrived "*in extremis*," if these patients could have received treatment a few hours earlier, many could have been saved. Of the total cases 85 per cent. occurred in August and September, and the epidemic had practically died out at the end of the year.

At the public mortuary I made 1,486 post-mortem examinations as compared with 1,696 in 1918, and 1,503 in 1917; the decrease in the figures is accounted for by the large epidemics of cerebrospinal fever and small-pox which swelled the figures for 1918 and 1917 respectively.

During the year 27,915 rats were examined, and of these ten were found plague-infected. The corresponding figures for 1918 were 17,814 rats and six plague-infected. The large increase—10,101 rats—was due to reorganization of the staff associated with this work.

The Tai Po Market dispensary was without a medical officer till Dr. Tuk went there in June. The patients treated there during the latter half of the year numbered 1,413.

The British schools and missionary establishments—the Victoria and Blind Homes, Kowloon City—have been examined by me, and all scholars and inmates reported on when necessary. These reports are forwarded to parents for compliance with my remarks which mainly concern the condition of teeth, throat and eyes.

Kowloon Dispensary.

During the year the attendance at the Government Dispensary, Kowloou, numbered 13,161, which includes seventy physical examinations and 215 vaccinations. Last year the figures were 13,686, and in 1917, 12,852, which, however, included 3,249 vaccinations The small diminution in figures is accounted for by the fact that some of the people who formerly came to the dispensary now go to the Kwong Wah Hospital since my appointment there, the latter institution being much nearer for many people.

A general anæsthetic was administered on four occasions only—we now use the Kwong Wah Hospital for Chiuese patients who need an anæsthetic.

The number of prescriptions dispensed during the year was 5,192 as compared with 5,189 in 1918.

During the year there were 195 ambulance cases compared with 269 in 1918 which were removed to various hospitals in the Colony. Of these, 107 were removed to hospitals in Victoria (thirty-four being European cases), and ninety-three to the Kwong Wah Hospital, Yaumati, being a decrease

Return of Diseases and Deaths in 1919 in the Civil Hospital, Victoria Hospital and the Gaol Hospital.

Hong-Kong.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	21	—	23
Anæmia	9	—	9
Anthrax	—	—	—
Beriberi	250	7	255
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	2	2	2
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	31	—	31
Delirium Tremens	—	—	—
Dengue	1	—	1
Diabetes Mellitus	1	1	1
Diabetes Insipidus	—	—	—
Diphtheria	9	3	12
Dysentery	73	2	73
Enteric Fever	19	6	19
Erysipelas	—	—	—
Febricula	79	—	79
Filariasis	—	—	—
Gonorrhœa	121	—	128
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	719	7	730
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	4	—	5
(*b*) Anæsthetic	1	—	1
(*c*) Mixed	—	—	—
Malarial Fever—	150	—	152
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	9	—	9
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	197	8	197
(*d*) Malarial Cachexia	14	1	14
Malta Fever	—	—	—
Measles	3	—	3
Mumps	5	—	5
New Growths—			
Non-malignant	39	—	41
Malignant	48	2	50
Old Age	—	—	—
Other Diseases	242	1	250
Pellagra	—	—	—
Plague	4	3	4
Pyæmia	2	—	2
Rachitis	—	—	—
Rheumatic Fever	3	—	3
Rheumatism	107	1	110
Rheumatoid Arthritis	—	—	—
Scarlet Fever	5	—	5
Scurvy	—	—	—
Septicæmia	8	1	8
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	1	—	1
Syphilis	—	—	—
(*a*) Primary	66	—	69
(*b*) Secondary	17	—	17
(*c*) Tertiary	41	1	44
(*d*) Congenital	3	1	3
Tetanus	1	1	1
Trypanosoma Fever	—	—	—
Tubercle—	69	11	80
(*a*) Phthisis Pulmonalis	68	22	74
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	1	—	1
Whooping-cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	250	5	258
Circulatory System	58	8	58
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	453	18	467
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	—	—	—
Eye	—	—	—
Generative System—	—	—	—
Male Organs	109	—	115
Female Organs	51	1	51
Lymphatic System	73	1	76
Mental Diseases	125	1	131
Nervous System	95	14	98
Nose	—	—	—
Organs of Locomotion	42	—	45
Respiratory System	265	36	276
Skin—	—	—	—
(*a*) Scabies	46	—	49
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	63	7	66
Injuries, General, Local—	665	57	713
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	37	—	37
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	18	1	20
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

of sixty cases for the hospitals in Victoria and nine cases for the Kwong Wah Hospital. The decrease in the Victoria cases is due to the absence of a cerebrospinal meningitis outbreak, whilst the Kwong Wah Hospital figures show a relative increase when the absence of cerebrospinal meningitis is considered.

TUNG WA HOSPITAL.

Report by Visiting Medical Officer.

University Students (Medical Clinic).—During the year, as heretofore, students have attended for lectures and demonstrations in clinical medicine and in the subjects of vaccination and pharmacy. Selected students act for periods of three months as clinical clerks in charge of medical cases under Western treatment.

The following figures express the comparative results of Eastern and Western treatment. It should be understood that all cases admitted are diagnosed by a staff trained in European methods, and the diagnosis is then confirmed or rejected by the visiting medical officer. It is then quite open to the patient to choose whichever of the two forms of treatment he may desire. The methods of Eastern medicine are not interfered with provided they do not endanger public health and sanitation. To the credit of the Eastern practitioner it must be stated that he frequently refuses to treat conditions in which he believes Western methods to be more successful.

The total number of in-patients were divided thus: Cases treated by Western methods, 3,764; cases treated by Eastern methods, 3,238; total, 7,002.

This shows that 53·7 per cent. of patients preferred Western and 46·3 per cent. Eastern medicine.

Deaths under Eastern treatment	...	1,172 = 36·1	per cent.
,, Western ,,	...	731 = 19·8	,,

(*A*) Diseases for which there is a specific remedy:—

Disease	Western Number of cases	Western Death-rate percentage	Eastern Number of cases	Eastern Death-rate percentage
Diphtheria	3 ...	66 ...	8 ...	10
Malaria	121 ...	10 ...	86 ...	44
Syphilis	74 ...	2 ...	33 ...	27
Cerebrospinal meningitis	89 ...	35 ...	38 ...	92

(*B*) Diseases for which, at present, there is no specific remedy:—

Lobar pneumonia ...	46	...	26	...	58	...	39
Influenza	251	...	12	...	238	...	22
Pulmonary phthisis ...	281	...	40	...	368	...	43

It will be seen that Western medicine, as judged by mortality, is as 11:27 compared with Eastern medicine where there is a specific remedy known, and as 7:10 where a specific remedy is not known.

Out-patient Department. Remarks on Special Diseases.

Beriberi.—In all 870 cases were treated with 296 deaths, i.e., 34 per cent. In 1918 there were 904 cases with a death-rate of 43·03 per cent. During the year a certain number of selected cases were placed on marmite, a yeast extract which is stated to contain a high vitamine percentage. The result cannot be described as wholly satisfactory, but the substance, which is pleasant to taste, was greatly appreciated, as it almost immediately relieved or even cured the sensory phenomenon of the disease, i.e., pain, numbness, and tightness of the hamstring tendons.

Malaria.—There were 207 cases admitted with fifty-one deaths, i.e., 23·6 per cent. In 1918 there were ninety-one cases treated with 25·2 per cent. mortality.

The following were the various types as differentiated by microscopic examination: Malignant, 172 cases with 49 deaths; benign, tertian, 15 cases with 0 deaths; malaria cachexia, 20 cases with 2 deaths.

The usual routine as to treatment was observed.

Cerebrospinal Meningitis.—127 cases with sixty-seven deaths were admitted (486 with 299 deaths in 1918).

The treatment was for the most part either definitely by Western or Eastern methods and various partial methods of treatment as recorded in 1918 were not necessary.

With Western treatment there was a mortality of 35 per cent. as compared with 92 per cent. when Eastern methods were used.

The serum used was prepared in the Bacteriological Institute, and all cases received intrathecal and either intravenous or subcutaneous injection.

Taking into consideration that the cases were in no way selected and were sometimes in a moribund condition, I think the mortality rate (i.e., 35 per cent.) quite justified the line of treatment adopted and the potency of the serum.

Had the cases been selected, i.e., persons between the ages of 10 and 35 who had not been ill for more than forty-eight hours, the mortality would have compared favourably with any obtained in England or America.

KWONG WAH HOSPITAL.

Report by Visiting Medical Officer.

I took up the post of visiting medical officer on April 15. The task I was faced with was not an easy one, and I have to thank Mr. Ho Kwong and his co-directors for giving me every assistance in their power. Without their co-operation and sympathy I should not have been able to carry out the many reforms that were found to be necessary in the hospital.

The buildings, which are comparatively modern and well planned on the "pavilion" style, were thoroughly renovated and the water-carriage system overhauled. The latter was in a very insanitary condition when I was appointed.

A new midwifery ward was opened at the end of July, and up to the end of the year 100 patients had been received.

Owing to the alteration in the nature of the work undertaken in the hospital—mainly surgical—I

found it necessary to suggest the setting aside of special rooms for the reception of patients after operation. This suggestion was carried out and obviates the necessity of carrying patients any distance—the rooms are 30 yards from the theatre—or of carrying them upstairs.

The entire hospital at the end of the year was fitted with iron bedsteads. The operating theatre, which is spacious and well designed and had not been used for the purposes of major surgery for some years past, was repainted and refitted, and the ante-room to the theatre fitted out with sterilizers for the instruments, and a suitable sterilizer for towels, dressings, overalls, &c., has also been installed in the room.

These alterations have enabled us to use the theatre for its proper purpose, and many operations have been performed since July.

Colonial Medical Reports.—No. 130.—Trinidad and Tobago.

MEDICAL ADMINISTRATION REPORT FOR THE YEAR 1919.

By K. S. WISE,
Surgeon-General.

Colonial Hospital.

This institution provides accommodation for 340 patients, but during the year the authorized number was almost constantly exceeded. The question of overcrowding due to the large number of senile and incurable cases in hospital and the lack of a proper and well-equipped out-patient department demands the urgent attention of the Government.

In my annual report for 1913-14 I commented on the increasing number of cases of malignant disease which seek admission to this hospital, and although an extended discussion of the medical and surgical aspects of the cancer problem lies outside the scope and plan of this report, I should like to refer again to this subject on account of its importance.

The figures show a yearly increase in the number of admissions of cancer cases. I have not made a critical and detailed analysis of the facts in connection with the cancer problem as it exists locally, but my impression is that malignant disease of the womb and female breast is uncommonly frequent in the Colony.

The term "cancer" is used here in a general sense and made to include all forms of malignant tumours. The reports of the Registrar-General give only the general mortality from cancer—that is, without reference to age and sex.

Although it is not strictly scientific to determine the increase in cancer mortality on the basis of its proportion to the mortality from all causes, this method is not altogether valueless. When due allowance is made for all the factors which affect the practical utility and accuracy of the above cancer mortality statistics, there remains no question or reasonable doubt that for general purposes the available data are useful in providing an approximate index of the frequency of cancer in this Colony. The argument that the increase is only apparent owing to greater accuracy of diagnosis may, I think, be dismissed at once, for while the early diagnosis of cancer is probably made much more frequently now than in former years, the recognition of the condition in its terminal stage was certainly not beyond the ability of even the tyro of thirty or forty years ago.

The introduction here in 1911 of the international classification of causes of death which in the case of cancer provides for seven large groups enhances the scietific value of our statistics. Formerly all deaths from malignant disease were grouped under the term "cancer." Under the new classification it is now possible to ascertain the death-rate for every important group of organs or parts of the body affected by malignant disease in the Colony.

The returns go to show not only that cancer in the aggregate is on the increase, but there has been a rise in the death-rate for every important group of organs or part of the body affected by malignant disease excepting the female breast. In this case the reduction is not real but only apparent, as it is, I believe, mainly attributable to successful operative treatment for this form of cancer and not to a diminished liability to the disease. This also shows that cancer of the female generative organs is responsible for the largest number of deaths from cancer, and that malignant affections of the stomach and liver claim a proportionately large number of victims.

In contrast to a decreasing mortality from pulmonary tuberculosis, ankylostomiasis, malaria, diseases of early infancy, dysentery and enteritis during the past few years, the death-rate from cancer is on the increase. Successful efforts have been made to reduce the death-rate from these affections by informing the public as to the methods of prevention, and it is satisfactory to note that general sanitary measures as well as special measures have helped to diminish their incidence, but with regard to cancer it is not possible to direct any measure against its prevalence in the absence of a known cause. Much, however, may be done to reduce the death-rate by educating the public as to the truths of cancer and by emphasizing the necessity for the early recognition and the prompt treatment of the disease on the ground that it is only in the incipient stage that hope of cure lies.

Colonial Medical Reports.—No. 130.—Trinidad and Tobago (*continued*).

RETURN OF DISEASES AND DEATHS IN 1919 IN THE COLONIAL HOSPITAL, SAN FERNANDO HOSPITAL AND THE DISTRICT AND YAWS HOSPITALS.

Trinidad and Tobago.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	30	1	30
Anæmia	62	6	63
Anthrax	—	—	—
Beriberi	1	—	1
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	3	—	3
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	94	21	101
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	28	5	30
Diabetes Insipidus	—	—	—
Diphtheria	7	2	7
Dysentery	—	—	—
Enteric Fever	637	152	675
Erysipelas	17	1	17
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	375	2	390
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	195	40	195
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	1	—	1
(*b*) Anæsthetic	12	1	12
(*c*) Mixed	5	—	5
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	741	33	759
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	11	—	11
(*c*) Pernicious	112	28	113
(*d*) Malarial Cachexia	46	3	49
Malta Fever	—	—	—
Measles	7	—	10
Mumps	—	—	—
New Growths—			
Non-malignant	—	—	—
Malignant	12	2	12
Old Age	139	69	162
Other Diseases	250	68	257
Pellagra	5	3	7
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	183	—	193
Rheumatoid Arthritis	4	2	4
Scarlet Fever	1	—	1
Scurvy	—	—	—
Septicæmia	17	12	17
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	80	—	80
(*b*) Secondary	91	—	94
(*c*) Tertiary	136	19	152
(*d*) Congenital	11	4	11
Tetanus	29	16	29
Trypanosoma Fever	—	—	—
Tubercle—	13	3	13
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued*.			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	4	—	5
Yaws	8	—	8
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	446	13	466
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	36	14	37
(*b*) Other Disesses	—	—	—
Digestive System—	—	—	—
(*a*) Diarrhœa	601	162	612
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	9	—	9
Congestion of Liver	11	—	11
(*d*) Abscess of Liver	17	3	17
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	9	—	9
(*g*) Cirrhosis of Liver	111	43	119
(*h*) Acute Yellow Atrophy	3	1	3
(*i*) Sprue	—	—	—
(*j*) Other Diseases	776	114	789
Ear	38	1	39
Eye	245	—	266
Generative System—	—	—	—
Male Organs	771	18	814
Female Organs	766	44	807
Lymphatic System	58	—	59
Mental Diseases	—	—	—
Nervous System	392	69	425
Nose	43	—	45
Organs of Locomotion	160	3	173
Respiratory System	1,220	326	1,297
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	1	—	1
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	28	—	28
(*f*) Other Diseases	996	26	1,098
Urinary System	638	211	680
Injuries, General, Local—	—	—	—
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	1	—	1
(*c*) Other Injuries	934	23	966
Parasites—	43	1	43
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	6	—	6
Corrosive Acids	2		2
Metallic Poisons	2	—	3
Vegetable Alkaloids	26	2	26
Nature Unknown	—	—	—
Other Poisons	88	—	89
Surgical Operations—	—	—	—
Amputations, Major	31	1	31
,, Minor	49	—	49
Other Operations	1,845	32	1,845
Eye	—	—	—
(*a*) Cataract	9	—	9
(*b*) Iridectomy	2	—	2
(*c*) Other Eye Operations	23	—	23

It is my sad experience that a considerable proportion of the mortality from this cause is, in part at least, directly attributable to public ignorance and neglect of known measures and means by which the mortality can be materially reduced. A very large proportion of the cases of malignant disease which come to hospital are in such a hopeless stage of the disease that operative intervention is generally out of the question. For instance, during the year under review twenty-nine cases of cancer of the womb were admitted, and in every one the growth was beyond the operative limit, with the result that these patients have either succumbed to the disease or are in a hopelessly incurable condition and suffering all the distressing symptoms of advanced cancer. In view of successful results obtained in cases operated upon in the early stage of the disease, it is evident that a fatal termination could, in many of these cases, have been prevented by the avoidance of delay in seeking competent advice.

The question is how shall the education of the public in this matter be undertaken? It seems to me that the only way to wage an effectual campaign against cancer is to draw public attention to the subject and to direct the attention of general practitioners to the importance of the earliest possible diagnosis and the immediate recourse to approved methods of treatment and cure. I would suggest the widest possible distribution of leaflets giving a concise outline of the salient facts in connection with cancer, and laying stress on the fact that the disease is, in all cases, local at the commencement; that the chief danger to the patient lies in the tendency toward a rapid extension; that the only certain remedy known to science is the complete surgical removal of the affected parts at the earliest possible time, and when this is done the outlook for a cure in the accepted sense of the term is decidedly hopeful, but that delay, neglect or refusal to submit to operative treatment are practically certain to result fatally within a comparatively short period of time.

This step may create a certain amount of alarm among the laity, many of whom might be led to imagine that they had symptoms of cancer, but I believe the good accomplished by educating the public in respect to the prevalence of cancer and the prevention of deaths from the disease would far outweigh any such harm.

These observations on cancer are made with the view of aiming primarily at the clear recognition on the part of the public of the supreme importance of the earliest possible diagnosis and the qualified treatment of the disease in its initial stage, for in this only lies the hope of reducing cancer mortality.

The Leper Asylum for 1919.

A system of hypodermic injections of gynocardate of soda was begun by Dr. Stewart, who had been specially appointed to perform this duty. With one or two brief breaks these injections have been continued by Drs. Lassalle, Tsoi-a-Sue, and now by the medical superintendent. Although the general health of those thus treated appears to be much improved, any real improvement resulting therefrom cannot at the present be said to be marked. In some cases stains and anæsthetic areas have been favourably affected. One patient who had great difficulty in using her fingers can now work with them as she had never done before. The treatment seems to be of more benefit to anæsthetic cases.

Charles W. Howatson,
Medical Superintendent.

Colonial Medical Reports.—No. 131.—Trinidad and Tobago.

REPORT ON HEALTH CONDITIONS FOR THE YEAR 1919.

Population.—This was estimated by the Registrar-General to be 384,247 at the middle of 1919, and at the end of 1919, 386,707. The density of population was 205 persons per square mile, as compared with 202 in the previous year.

Births.—The total number of births registered was 11,567; of these 5,801 were males and 5,766 females. The birth-rate was 30·10 per mille of population, showing a diminishing birth-rate from 1917—a very unsatisfactory circumstance.

Stillbirths.—The record was less satisfactory than in the previous year, the number of stillbirths being 775 in 1918 and 866 in 1919.

Deaths.—The total number of deaths from all causes registered in the Colony was 9,398, the death-rate per 1,000 living being 24·46, as compared with 21·70 in 1918.

Infantile Mortality.—There were 11,567 births registered and 1,790 deaths of infants under 1 year, giving an infant mortality rate of 154·7 (or nearly 155) per 1,000 births in the whole Colony. In Port-of-Spain there were 1,484 births and 300 deaths of infants under 1 year, the infant mortality rate being 202·1 per 1,000 births. Exclusive of Port-of-Spain the infant mortality rate was 148·6.

The work of the Baby Welfare League was continued throughout the year, especially in Port-of-Spain, where a crèche was maintained.

The two district nurse visitors did excellent work in Port-of-Spain, both at the Mothers' and Infants' Clinic as well as at the homes of the infants.

A branch of the League established at St. Joseph did splendid work in that town as well as at Caroni.

One looks forward to the time when country branches of the League will be established in all districts, and the services of the League district nurse-midwife will be available for all those who are unable to pay the usual fees of private nurses.

COMMUNICABLE DISEASES.

Enteric Fever.—There were 729 cases notified and 203 deaths registered throughout the Colony.

In Port-of-Spain 330 cases were notified and eighty-two deaths registered. In all other parts of the Colony there were 399 cases and 121 deaths.

The enteric fever death-rate in 1919 was 5·2 per 10,000 and 6·5 in 1918. It is satisfactory that there was a substantial reduction of the enteric fever incidence.

Tuberculosis.—The number of deaths from tuberculosis (all forms) registered was 504.

The tuberculosis death-rate per 10,000 of population shows a satisfactory reduction of the mortality.

Of the 504 deaths recorded, 240 occurred in Port-of-Spain and 264 in other parts of the Colony.

Diphtheria.—As usual there were sporadic cases of diphtheria.

The number of cases notified was eleven. Of the eleven cases, two were fatal, one in San Fernando and the other in Port-of-Spain.

The various forms of malaria were very prevalent during the year.

A spleen census was taken; 18,145 children were examined on estates and in elementary schools; 1,382 were found to have enlarged spleens.

The following minor operations for controlling malaria were carried out in malarious districts by employés of the local authorities at Government expense, viz.:—

(*a*) Oiling collections of stagnant water in and around villages.

(*b*) Clearing obstructed drains of rubbish, debris, leaves, &c.

(*c*) Straightening the courses of small watercourses and abolishing small pools in them.

(*d*) Draining and oiling borrow-pits at the sides of roads and railway lines in the vicinity of villages.

Similar work was done in the urban district of San Fernando at the expense of the local authority.

At Carenage a good deal of filling of a low-lying, swampy area was done.

The number of deaths from malaria was 1,007.

Our anti-malarial measures are insufficient up to the present. Much more money will have to be spent, and a vigorous campaign against the breeding grounds of anopheles in all parts of the Colony put into operation. Malaria is the chief cause of mortality among the labouring population in rural districts. It also incapacitates a great number of working men temporarily or permanently. The conservation of their health is of vital importance to agriculture on which the Colony depends, especially now that our labour supply is insufficient for our needs.

Ankylostomiasis.—This disease, which was very prevalent, together with malaria, is the greatest enemy of the labouring population.

There were 302 deaths registered, with a death-rate of 7·86 per 10,000 population.

The Central Board of Health had under consideration the question of latrines in country districts. It was agreed at a meeting of the Board to carry out experiments in various districts with different types to ascertain those best suited to conditions in different localities.

At a meeting of the Board held on December 23, 1919, the following resolution was moved by the Surgeon-General and unanimously approved: "That the Board do recommend that the Public Health Ordinance, 1915, be amended so as to make it an offence punishable on summary conviction to deposit human excreta or to defæcate anywhere except in a properly constructed privy in any district, within a quarter of a mile of any occupied building."

There was an epidemic of influenza between April and July which caused 332 deaths. Deaths from bronchitis and pneumonia, the most frequent complication of influenza, numbered 1,034 in 1919 and only 738 in 1918.

Pneumonia was proclaimed an infectious disease early in the year, and was therefore compulsorily notifiable.

In the light of statistics it emerges that 1919 was a very "unhealthy" year. The vital statistics disclose two alarming features, viz., a lower birth-rate (30·10), and a higher death-rate (24·46) than in the previous year. Another disquieting circumstance was a large increase in the number of still-births.

There was considerable improvement in the incidence of and the mortality from the two principal infectious diseases, viz., enteric fever and tuberculosis, and there is every reason to believe that this improvement will be maintained in the future.

Broadly speaking, the special insanitary conditions, allied to each group of diseases, require constant attention, and sanitary efforts should be directed towards securing the following:—

(1) The elimination of mosquito breeding grounds.

(2) The provision of pure water and food supplies.

(3) The provision of proper sanitary conveniences in connection with all dwellings, without exception, and the prevention of soil pollution in the vicinity of houses.

The time has arrived, I think, when members of local sanitary authorities should interest themselves in preventive methods against stillbirths and deaths among infants, due largely to ignorance of parents and of uncertified midwives. Members of local authorities being among the most prominent and influential persons in their districts could take up the question seriously, enlist the sympathy and support of other persons of influence in the district,

and do their utmost to establish a branch of the Child Welfare League. One of the most important objects of the League is to provide trained district nurse-midwives to attend to cases of child-birth and to educate mothers in the feeding and rearing of babies.

Public Health Administration.

Local Authorities in Rural Districts.

An amending Ordinance was passed by the Legislative Council on May 30, and came into force by the Governor's proclamation on October 1, 1919.

The Ordinance dealt with many matters, of which the following are the most important, viz.: (1) Unsound Food; (2) Importation of Food and Drink; (3) Sale of Oysters and other Shellfish; (4) Hotels, Restaurants and Shops where Food is sold by retail; (5) Hucksters; (6) Barbers' Shops; (7) Slaughter-houses; (8) Sale of Fresh Meat in Proclaimed Areas; (9) Miscellaneous Provisions.

Central Board of Health.

The Board approved on August 5 of the following bye-laws, viz.: (*a*) Bye-laws relating to mosquitoes in rural districts; (*b*) bye-laws relating to house refuse in certain rural districts; (*c*) bye-laws relating to barracks and barrack yards in rural districts.

At a meeting held on December 23 a model plan and specification of a barrack in a rural district was considered and approved.

An exhaustive report on the subject of venereal diseases was submitted on July 2 by the Committee appointed in 1918, but up to the end of the year under review no action had been taken.

It is hoped that at least some of the recommendations which follow closely those of the Royal Commission in England will be carried out in the near future.

Digest of Annual Reports of Medical Officers of Health.

Arima District.—There were eighty-seven cases of enteric fever, thirty-five of tuberculosis, and sixty-eight of influenzal pneumonia notified. Influenza prevailed from April to July. A satisfactory increase is recorded of the number of privies erected; 609 were built between June and December.

Diego Martin District.—Ankylostomiasis was very prevalent.

Tacarigua.—Water supply at Arouca and small villages along the eastern main road is very bad. Besides this, the bad state of the eastern main road drains, mosquito breeding grounds, absence of suitable privy accommodation in small villages are the many insanitary features. Typhoid fever, tuberculosis, influenza, pneumonia, measles, whooping-cough and chicken-pox were the principal infectious diseases.

Chaguanas-Cunupia.—There was an outbreak of influenza complicated with pneumonia. Typhoid fever occurred in different parts of the district; in some cases infection was traced to Port-of-Spain. The water supply is bad generally. In Chaguanas Village the Government rain-water cistern is of great use to the people, and especially to bakeries and aerated water factories. The Ankylostomiasis Commission operated at Cunupia, Longdenville and Carapichaima, and sanitary conveniences were provided in villages.

Princes Town and North Naparima.—The year was unhealthy; influenza of a severe type prevailed from April to August, and was responsible for many deaths. The water supply was inadequate and unwholesome.

Ortoire-Moruga.—An epidemic of influenza of a serious type broke out and lasted from April to August. Forty-eight deaths were due to pneumonia (influenzal). Ankylostomiasis was very prevalent. All villages are now fairly well supplied with sanitary conveniences. The water supply is very bad.

Gran Couva.—There was a great deal of illness in the first half of the year. A small epidemic of influenza occurred in June. Measles was prevalent. Water supply unsatisfactory.

Erin-Siparia.—Influenza was prevalent from May to July. Typhoid fever and whooping-cough occurred. Old La Brea Village—very insanitary.

Scarborough-Tobago.—Swamps, outlets of rivers, absence of proper water supply and of an abattoir, require attention. Splendid work has been done in draining the swamp on the Bon Accord Estate. Sanitary progress is recorded in connection with the protection of food, condition of shops, aerated water factories, bakehouses, yards and disposal of house and excreted refuse. Infantile mortality is excessive. The appointment of a district nurse is necessary.

Roxborough, Tobago.—Water supply is very unsatisfactory. Dysentery and malaria were very prevalent. Yaws is a serious problem in connection with which a campaign is outlined.

Colonial Medical Reports.—No. 132.—Cairo.

REPORT OF THE MEDICAL OFFICER OF HEALTH, CAIRO CITY, FOR 1917, 1918 AND 1919.

Introduction.

The conditions which prevailed during 1915 and 1916 owing to the war, which caused an extra strain on the work of this Department and necessitated publishing the report for the two years together, continued during 1917 and 1918.

During 1917 the position was somewhat ameliorated, and this was to a great extent due to the absence of any infectious disease in an epidemic form. In 1918, however, there was an extensive prevalence of typhus and relapsing fever which increased the work enormously.

Although the military authorities had made arrangements to treat certain of their infectious diseases in their own hospitals, the Government Fever Hospital continued to accept cases of typhus and relapsing fever, the majority of which were from among the prisoners of war. Military cases of small-pox were also treated throughout the year. In consequence the resources of the Fever Hospital were strained to the full.

A combined report for 1917 and 1918 is now issued.

Vital Statistics.

Population.

The mid-year population for Cairo in 1917 was estimated by the Statistical Department at 749,000, consisting of 673,000 Egyptians and 76,000 foreigners.

A later estimate, based on the last census, placed the population of Cairo at 753,624.

As, however, the error resulting from calculations based on the first estimate would be very small, the difference of the two populations being only about 4,500, it has been decided to allow the original estimate, i.e., 749,000, to stand.

The estimated mid-year population for Cairo in 1918 was 760,008, consisting of 702,172 Egyptians and 57,836 foreigners.

In addition the population of the various districts dealt with by us for all health statistics, excepting births and deaths, is estimated at 24,762, making a total for Cairo of 784,770.

Births.

During 1917 the total number of births which occurred in Cairo was 31,442. Of this total 30,943 were native and 499 foreign births. The annual birth-rate was therefore 42·0 per thousand of population.

During 1918 there occurred 28,047 births in Cairo. The annual birth-rate was therefore 36·9 per thousand of the population.

Stillbirths.—During 1917, 1,236 children were born dead. Of these, 1,216 were of Egyptian parentage and twenty of foreign.

Deaths

During 1917 a total of 27,955 deaths occurred in Cairo.

Of these, however, 1,151 were deaths of non-residents, leaving 26,804 for Cairo proper. This gives an annual death-rate of 35·8 per thousand of the population, as compared with a rate of 38·3 for 1916 and 44·3 for 1915.

The total number of deaths which occurred in Cairo during 1918 was 43,198. Out of this total, however, 5,630 should be excluded as they are deaths of non-residents.

Infantile Mortality.

Eight thousand two hundred and forty-eight children under 1 year of age died during 1917, giving an infantile mortality of 262 per thousand births for the whole city.

Of the 8,248 deaths of children under the age of 1 year occurring in 1917, 8,176 were deaths of Egyptian infants and seventy-two of foreigners.

During 1918 there were 9,242 deaths of children under 1 year. This total included 9,184 natives and fifty-eight Europeans.

Infectious Disease.

During 1917, 5,099 cases of notifiable infectious disease were recorded in Cairo. To be deducted from this number are 123 cases inscribed in the City register, but concerning hospital patients of extra-urban provenance. This leaves the number of cases belonging to Cairo recorded in 1917 as 4,976.

Of this 4,976 cases, 672 belong to the less important diseases, being composed of: whooping-cough, 147; mumps, 155; chicken-pox, 243; rabies, 91; Malta fever, 2; and tetanus, 33.

This leaves 4,304 cases with 1,608 deaths which are ascribable to the eight principal diseases, viz., small-pox, measles, scarlet fever, typhus, typhoid, relapsing fever, diphtheria, cerebrospinal fever.

Typhoid Fever.—1,141 cases.

There were 384 deaths from this disease, giving a death-rate of 0·512 per thousand.

Typhus fever, 767 cases; relapsing fever, 244 cases; diphtheria, 764 cases; measles, 1,034 cases; small-pox, 48 cases; cerebrospinal fever, 13 cases; scarlet fever, 293 cases.

Puerperal Fever.—Fifty-five deaths certified as puerperal fever, of which fifty-two were Egyptians and three Europeans, were recorded.

The death-rate for this disease, therefore, was 0·073 per thousand of population.

Estimated on the birth figures for the year the maternal death-rate was 1·766 per thousand births. In addition to the fifty-five deaths declared as from puerperal fever, twenty-seven occurred within

fifteen days of confinement. The causes assigned were uræmia, 4; peritonitis, 1; eclampsia, 3; nephritis, 1; typhus, 1; typhoid, 1; tetanus, 1; hæmorrhage, 8; difficult labour, 3; abortion, 1; general anasarca, 1; endometritis, 1; and pneumonia, 1.

In 1918.

During 1918 there were 9,703 cases of notifiable diseases recorded in Cairo.

Of this total, 614 belong to the less important diseases, such as chicken-pox, 221, whooping-cough, 180; mumps, 69; tetanus, 29; Mediterranean fever, 26; anthrax, 1; leprosy, 3; and rabies, 85.

This leaves 3,397 deaths ascribable to the eight principal diseases, viz., small-pox, measles, typhoid fever, typhus fever, cerebrospinal fever, scarlet fever, relapsing fever, and diphtheria.

Typhoid fever, 1,609 cases; typhus fever, 4,433 cases; relapsing fever, 1,287 cases; diphtheria, 632 cases; measles, 168 cases; small-pox, 35 cases; cerebrospinal fever, 23 cases; scarlet fever, 81 cases.

Puerperal Fever.—There were eighty-five deaths certified as puerperal fever. Eighty-three were deaths of native women and two of Europeans.

In addition there were thirty-one other maternal deaths which occurred within fifteen days of confinement.

The causes given on the death certificates were eclampsia, 8; difficult labour, 7; hæmorrhage, 2; heart failure, 1; typhus, 3; tuberculosis, 1; pneumonia, 2; abortion, 1; typhoid fever, 1; kidney disease, 3; peritonitis, 2.

Influenza.—545 deaths were certified as influenza, 536 of which occurred from October 1 to December 31.

The number of deaths certified as pneumonia, bronchitis, pleurisy, and other respiratory diseases (exclusive of tuberculosis), began to rise in October and increased rapidly in November and December, so that there is reason to believe that many of these were the result of influenza.

The total number of deaths from these respiratory diseases during the year was 6,293, which, added to the 545 deaths from influenza, makes a total of 6,838, or 18·2 per cent. of the total deaths of Cairo City.

The 545 deaths from influenza according to age were thirteen from 0 to 1 year, ninety-five from 1 to 5, fifty-two from 5 to 10, seventy-seven from 10 to 20, 196 from 20 to 40, seventy-one from 40 to 60, and forty-one above 60 years.

Disinfection Service.

During 1917, 34,546 rooms and their contents were disinfected by the Disinfection Services of 'Abbâsîya and Fum el Khalig; 12,742 rooms were done by the former Service and 21,804 by the latter.

Of the rooms disinfected by the 'Abbâsîya Service, 431 were disinfected with formalin, 8,105 with sublimate solution, and 4,206 with cyllin.

The Fum el Khalig Service disinfected 419 rooms with formalin, 5,384 rooms with sublimate, and 3,259 rooms with cyllin.

In addition, 128,984 articles of clothing were removed during the year by the two Services for steam disinfection.

Of this number, 82,594 articles were disinfected at 'Abbâsîya and 96,390 at Fum el Khalig, making a daily average of 226·2 for the former Service and 127 for the latter.

During 1918, 36,332 rooms and their contents were disinfected by the Disinfection Services of 'Abbâsîya and Fum el Khalig.

Of the rooms disinfected by 'Abbâsîya 409 were done with formalin, 14,290 with sublimate, and 5,999 with cyllin.

The Fum el Khalig Service disinfected 340 rooms with formalin, 11,443 with sublimate, and 3,845 with cyllin.

In addition, 370,055 articles of clothing were removed during the year for steam disinfection.

Fever Hospital.

During 1917 the total number of admissions to the Government Fever Hospital was 1,610. From this total should be deducted 206 military and extra-urban cases, leaving a total of 1,404 admissions of cases belonging to Cairo proper.

The admissions included thirty-three cases of small-pox, twenty-four of chicken-pox, forty of measles, seventeen of scarlet fever, seventy-one of typhoid fever, 419 of typhus fever, 211 of relapsing fever, ten of cerebrospinal fever, thirty-seven of diphtheria, thirteen of mumps, one of bubonic plague, seven of paratyphoid fever, two of para-Malta fever, and 519 other cases consisting of 321 cases sent to hospital under a mistaken diagnosis of infectious disease, 131 persons under observation in whom no disease was discovered, and sixty-seven mothers and other persons accompanying patients.

The admissions from the eight principal notifiable diseases (small-pox, measles, typhoid fever and paratyphoid fever, typhus fever, relapsing fever, cerebrospinal fever, scarlet fever and diphtheria), excluding 104 extra-urban cases, were 845.

There were 193 deaths in the hospital, which includes thirty-two deaths of patients suffering from various diseases other than infectious who had been sent to hospital under a mistaken diagnosis, but whose condition on arrival did not permit of a refusal of admission.

These included four of erysipelas, one malaria, six pneumonia, three tetanus, three septicæmia, four heart diseases, eight acute gastro-enteritis, two uræmia, and one pyæmia.

The number of deaths from infectious diseases was 161. Therefore the death-rate in the hospital was 12·0 per cent.

The infectious deaths give case mortalities of 8·5 per cent. in small-pox, 7·7 per cent. in chicken-pox, 7·3 per cent. in measles, 19 per cent. in scarlet fever, 13 per cent. in typhoid fever, 22·7 per cent. in typhus fever, 4·1 per cent. in relapsing fever, 75 per cent. in cerebrospinal fever, 29·2 per cent. in diphtheria, and 6·6 per cent. in mumps.

Included among the 1,336 third-class admissions were 134 sick convicts from the Cairo prisons.

Of these one suffered from small-pox, twelve from

typhoid fever, twenty-five from typhus, thirty from relapsing fever, one from mumps, three from paratyphoid, one from Malta fever, two from malaria, two from pertussis, twelve from erysipelas, and forty-five from other non-infectious diseases.

Of the convict patients ten died, death being due to typhoid fever, 6; relapsing fever, 1; erysipelas, 1; Malta fever, 1; and one from a non-infectious disease.

In 1918 there were 5,207 patients admitted to hospital.

The admissions included thirty cases of small-pox, seven of chicken-pox, fourteen of measles, eight of scarlet fever, 118 of typhoid fever, 1,887 of typhus fever, 1,132 of relapsing fever, ten of cerebrospinal fever, fifty-seven of diphtheria, twelve of mumps, sixteen of para-Malta fever, and 1,915 other cases consisting of 970 cases sent to hospital under a mistaken diagnosis, 884 sent in under observation, and sixty-one mothers of young children and persons accompanying patients.

The admissions from the eight principal notifiable diseases (small-pox, measles, scarlet fever, typhoid and paratyphoid fever, typhus fever, relapsing fever, cerebrospinal fever, and diphtheria) in 1918 were 3,256.

There were 643 deaths in the hospital during the year.

Of these one was caused by small-pox, twenty-six by typhoid fever, 489 by typhus fever, two by cerebrospinal fever, seventeen by relapsing fever, one by mumps, four by Malta fever, and twenty-six by various non-infectious diseases in the case of patients sent to hospital under a mistaken diagnosis and whose condition did not allow a refusal of admission.

The number of deaths from infectious diseases was 617.

The infectious deaths give case-mortalities of 3 per cent. in small-pox, 30 per cent. in chicken-pox, 5 per cent. in measles, 13·8 per cent. in typhoid, 21·3 per cent. in typhus, 5·1 per cent. in relapsing fever, 18·1 per cent. in cerebrospinal fever, 28·8 per cent. in diphtheria, 6·6 per cent. in mumps, and 14·1 per cent. in Malta fever.

There were 353 sick convicts admitted from the Cairo prisons. Of these two were cases of small-pox, one chicken-pox, twenty-seven typhoid, forty-three typhus, 154 relapsing fever, three diphtheria, one mumps, three Malta fever, four malaria, three pertussis, and 112 other non-infectious diseases.

There were ten deaths among these, the cause of death being due to scarlet fever, 1; typhoid fever, 4; relapsing fever, 2; diphtheria, 1; whooping-cough, 1; and one from a non-infectious disease.

In the Hospital Laboratory 3,861 examinations of specimens were carried out during the year. These include 172 films for malaria, 1,593 for relapsing fever, 884 Widal's reaction for typhoid, 200 paratyphoid, thirty-three Malta fever, 783 Weil-Felix, fifteen typhoid blood cultures, thirty cultures for stools and urine from typhoid and paratyphoid fevers, sixty specimens of sputa for T.B., eighty-five for diphtheria, five specimens of fluid for cerebrospinal fever, and one specimen for plague.

Ambulance Service.

During 1917, 1,869 calls were made on the Ambulance Service. One hundred and eighty journeys were made by the ambulance of the first-class, 195 by those of the second-class, 490 by the third-class, and 1,004 by hooded carts.

During 1918 there were 4,904 calls made on the Ambulance Service. Two hundred and fifty journeys were made by the first-class ambulance, 399 by the ambulance of the second-class, 378 by those of the third-class, and 3,887 by the hooded carts.

Death Inquiries.

The average daily number of death inquiries held in 1917 was 53·9; the daily average of examinations carried out by the district medical officers was 37·6; the daily average of death inquiries held by the *hakimas* was 11·2.

In the outlying villages the daily average of inquiries was 4·6 by the sanitary barbers and 0·41 by the *dâyas* of the various districts concerned.

Vaccinations.

During 1917, 31,194 vaccinations were carried out by the medical officers of the Inspectorate and the various districts.

Of these vaccinations, 29,262 were primary vaccinations, 28,954 being for native children and 308 for Europeans.

The remaining 1,932 were revaccinations of persons in contact with small-pox cases or of persons applying for it.

Of these 1,875 were natives and fifty-seven Europeans.

There were 27,739 vaccinations during 1918.

Out of the total of vaccinations during 1918, 25,613 were primary, 25,312 being for native children and 301 for Europeans.

The remaining 2,126 were revaccinations of persons in contact with small-pox cases or of persons applying for it.

Of these 2,121 were natives and five Europeans.

Sanitary Control of Public Women.

Examination of Native Prostitutes.

During 1917 there were 351 new registrations, which, added to the 1,379 carried over from 1916, gives a total of 1,730 women inscribed in the registers for this year.

Five hundred and twenty-four names were struck off the registers during the year for various reasons, such as death, leaving the district, evasion of supervision. There remained, therefore, 1,206 women at the end of the year to be carried on the registers of 1918.

There were 36,685 examinations carried out in 1917 by the medical officers in charge.

During the course of the year 2,081 women were found suffering from venereal diseases and sent to hospital for treatment.

There were 335 cases of syphilis, 1,604 of gonorrhœa, and 190 of chancroids.

During 1918 the total number of native prostitutes on the registers was 1,573. Out of this number 1,206 were carried over from 1917, whilst 367 were newly registered during 1918.

The average number of examinations per woman was 18·6. 3,742 women were found suffering from venereal disease and sent to hospital for treatment. Fifty-two were discovered to be suffering from double infection. The percentage of examinations revealing disease was 13 per cent. 3,472 were cases of gonorrhœa and 232 of syphilis. There were, besides, ninety cases of chancroids.

An analysis of the diseases shows a marked diminution in the incidence of syphilis, more particularly the primary stage. This is probably due to more accurate diagnosis.

Wassermann reaction has been employed in the diagnosis of all doubtful cases presenting no infectious lesion but merely a doubtful rash or adenitis.

By this means a large number of cases—potential sources of infection—have been brought under treatment.

The largest number of cases of gonorrhœa were due to urethritis, whilst cases of cervitis were relatively of infrequent occurrence.

This is no doubt partly due to the fact that the women, before presenting themselves for examination, have the vagina and cervix douched and swabbed with astringent lotions, and thus altering the diagnosis value of the discharge if any should still remain.

At the same time there is no doubt that urethritis is much the commonest lesion and is peculiarly intractable.

Examination of European Prostitutes.

During 1917 there were ninety-four fresh registrations, which gives a total of 519 women on the registers during the year. 156 were struck off during the year for various reasons.

The number of examinations held in 1917 was 16,372, making an average of 31·5 examinations per woman.

Three hundred and twenty-nine were sent to hospital during the year, either because they were diseased or for observation. This gives a percentage of 2·0 per cent. examinations exposing diseased conditions, as against 3·5 per cent. in 1916 and 4·4 per cent. in 1915.

During 1918 there were 440 European women on the registers. Seventeen were new names. Forty-eight names were struck off for various reasons.

The total number of examinations held during the year was 17,275, which gives an average of 39·3 examinations per woman. In the course of these examinations 450 cases of venereal disease were discovered and sent to hospital for treatment.

European Lock Hospital.

During 1917 there were 329 cases admitted to hospital, of whom twenty-four were suffering from syphilis, 254 from gonorrhœa, and fourteen from venereal sores. The remaining twenty-seven were found not to be diseased.

At the end of the year there were only four women remaining in hospital, all of whom were suffering from chronic gonorrhœa.

The average period of detention for those suffering from syphilis was 42·5 days for primary cases, 31·7 for secondary, 18·6 for tertiary, and 35·5 for all cases.

As regards gonorrhœa, the average number of days in hospital was 49·7 for acute cases and 16·2 for chronic. The patients under observation were detained on an average 3·5 days, whilst the average number of days for those suffering from venereal sores was 8·8 days.

During 1918 there were 450 admissions. Out of this total twenty-five were suffering from syphilis, 357 from gonorrhœa, and twelve from venereal sores. The remaining fifty-six were found after observation to be free from venereal disease.

At the end of the year there were seventeen patients remaining in hospital, sixteen of whom were suffering from gonorrhœa and one from chancroids. The average stay of these in hospital was 18·9 days for all diseases, including those under observation. The average period of detention for those suffering from syphilis was 30·9 days, for gonorrhœa 20·5 days, and chancroids 15·1 days.

Unhealthy, Inconvenient and Dangerous Establishments.

During 1917 there were 1,653 establishments which were inspected for licensing and, after compliance with the conditions laid down, subsequently licensed.

There has been a gradual improvement as regards certain establishments, but as regards restaurants, confectionery establishments, dairies and milk shops, no improvement is noted owing to the shortage of the overseers' staff resulting in a diminution of visits, and partly to the greater stringency with which inspections were made in the last two years.

Whenever conditions were found unsatisfactory the proprietor was warned, and a time limit fixed within which the necessary improvements had to be carried out, failure to comply being followed by legal proceedings.

Bakeries, dairies, milk shops and other establishments gave the most frequent cause for complaint. In the greater number of these cases objection was taken to faulty arrangements for removal of smoke. The most satisfactory were grocers' shops, butchers, restaurants and public kitchens, vegetable dealers, and fish shops with 1 per cent. of faults found on inspection.

Prosecutions.

During the year 1917, 2,010 fresh prosecutions were instituted. Of this total, convictions were obtained in 1,737 of the cases. In fifty-three the verdict was acquittal, whilst in eighty-one the case was filed usually either on account of the evidence put forward being considered insufficient to make a conviction probable or because the defendant had meanwhile put himself in a position of compliance with the law and the case did not call for further action.

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The fresh prosecutions were for contraventions against the vidange regulations for illegal practice of medicine and its branches; for offence against the vaccination laws; for failure to fence vacant land; for failure to notify infectious disease or other offences against the Infectious Diseases Law; for offences against the Pharmacies and Sale of Poisons Decree; for transgressions of the Assistant Pharmacist's Law; for failure to comply with the regulations of the Births and Deaths Decree; for infringements of the Law and Regulation for the control of objectionable, unhealthy and dangerous establishments; for general sanitary contraventions against the Native and Mixed Penal Code; prosecutions for the adulteration of milk under Article 302 of the Penal Code; selling meat not stamped with the *abattoir* stamp; and offences against the *Arrêté* of June 7, 1913, regarding cleanliness of streets.

During 1918, 1,853 fresh prosecutions were instituted for similar offences.

REPORT FOR THE YEAR 1919.

Vital Statistics.

Population.

The estimated mid-year population of Cairo in 1919 was 761,525, consisting of 703,818 Egyptians and 57,707 non-Egyptians.

Births.

During 1919 there occurred 31,974 births in Cairo. The annual birth-rate was therefore 42·0 per thousand of the population.

Stillbirths.—During 1919 there were 1,215 stillbirths.

Deaths.

During 1919 the total number of deaths in Cairo was 35,581, of which 4,034 were deaths of non-residents, leaving 31,547 as the total for Cairo City. This gives an annual death-rate of 41·4 per thousand of population.

Infantile Mortality.

The total infantile deaths in Cairo during 1919 were 7,768, a figure which includes 147 deaths of children from outside districts that occurred in various public institutions in the City. This leaves a total of 7,621 belonging to Cairo proper.

Of the 7,621 deaths of children under 1 year, 7,549 were deaths of Egyptian infants and seventy-two of foreigners.

Infectious Diseases.

The total number of infectious diseases recorded in Cairo during 1919 was 10,240.

Of this total, 9,164 cases with 3,970 deaths belong to the eight principal diseases, viz., small-pox, measles, scarlet fever, diphtheria, typhoid, typhus, relapsing fever, and cerebrospinal fever.

Of the less important diseases, which amounted to 708, there were 178 of chicken-pox, 101 of whooping-cough, twenty-four of tetanus, 364 of influenza, twenty-six of mumps, seven of Malta fever, and eight of rabies.

Small-pox.—During 1919 there were recorded 1,455 cases of small-pox.

There were 494 deaths from this disease, or 0·628 per thousand living.

Measles.—During 1919 there were 719 cases of measles.

Scarlet Fever.—The total number of cases recorded this year was thirty-nine.

Diphtheria.—The number of cases recorded in 1919 was 484.

Typhoid Fever.—The total number of cases of typhoid fever recorded was 1,383.

Typhus.—The number of cases recorded during 1919 was 4,825.

Relapsing Fever.—The number of cases recorded in Cairo during 1919 was 236.

Cerebrospinal Fever.—The number of cases recorded was twenty-three.

Puerperal Fever.—During 1919 there were fifty-five deaths certified as due to puerperal fever, of which fifty-two were deaths of Egyptian women and three of Europeans.

The death-rate for this disease was therefore 0·072 per thousand of the population.

Estimated on the total number of births during the year, the maternal death-rate was 1·720 per thousand births.

Besides these deaths, there were twenty-five women who died within fifteen days of their confinement.

The causes of death of the women who died within fifteen days of their confinement, apart from puerperal fever, were: Hæmorrhage, 4; difficult labour, 1; eclampsia, 7; abortion, 1; peritonitis, 2; typhoid, 1; uræmia, 1; heart disease, 1; small-pox, 2; dysentery, 1; typhus, 2; albuminuria, 1; tuberculosis, 1.

Influenza.—During 1919 the total number of cases notified as influenza was 364.

As regards the deaths from this disease there were 131 diagnosed as such.

There were besides 4,737 deaths attributable to some form of respiratory disease, exclusive of tuberculosis, a proportion of which were most probably the result of influenza.

These deaths included 1,593 from pneumonia, fifty-four from pleurisy, 2,750 from bronchitis, and 340 from respiratory diseases.

The ratio of deaths from influenza to the total deaths in Cairo was 0·4 per cent. The ratio of deaths from the respiratory diseases was 15·0 per cent.

It must, however, be considered that 1,025 deaths from the respiratory diseases referred to children under 1 year.

Disinfection Service.

During 1919, 51,939 rooms were disinfected by the two Services of 'Abbâsîya and Fum el Khalig, the former being responsible for 36,107 rooms, whilst 15,832 rooms were done by the latter.

Of the 36,107 rooms disinfected by the 'Abbâsîya Service, 503 were done with formaline, 15,677 with sublimate, and 19,927 with cyllin.

The Fum el Khalig Service disinfected 348 rooms with formaline, 11,599 with sublimate, and 3,885 with cyllin.

The 'Abbâsîya Service disinfected also 270,453 articles of clothing by steam, whilst Fum el Khalig was responsible for 59,295.

Fever Hospital.

During the year 1919 there were 5,530 admissions to the Government fever hospital. Of these admissions, 3,712 were male and 1,818 female.

The admissions consisted of 1,135 cases of small-pox, fifty-one of chicken-pox, twenty-seven of measles, five of scarlet fever, 121 of typhoid fever, 2,279 of typhus fever, 329 of relapsing fever, eleven of cerebrospinal fever, fifty-six of diphtheria, nine of mumps, thirteen of erysipelas, ten of paratyphoid, six of para-Malta, and 1,478 other cases consisting of 750 cases sent to hospital under a mistaken diagnosis of infectious disease, 591 persons sent in under observation in whom no disease of any sort manifested itself, and 137 mothers of young children and other persons accompanying patients. Of 750 sent to the hospital under a mistaken diagnosis, 411 were cases of influenza. The remainder were not cases of infectious disease, and were found on examination to consist of eighty-nine cases of enteritis, sixteen cases of pneumonia, thirty-seven cases of bronchitis, fifteen cases of pulmonary tuberculosis, six cases of mania, fifty-five cases of malaria, five cases of tetanus, seven cases of tonsillitis, three cases of whooping-cough, six cases of rheumatism, eight cases of dysentery, thirty-three cases of various skin diseases, and fifty-nine such other cases as pyæmic abscess, pleurisy, cancer, heart disease, gangrenous peritonitis, senility, &c.

The admissions from the eight principal notifiable diseases (small-pox, measles, scarlet fever, diphtheria, typhoid fever, relapsing fever, and cerebrospinal fever) were 3,963.

There were 856 deaths in the hospital during 1919. In addition there were fifty-three deaths amongst patients sent in under a mistaken diagnosis of various infectious diseases, and whose condition on arrival did not permit of a refusal of admission. Of these, three were heart disease, eight bronchitis, three senility, three diarrhœa, three dysentery, two premature labour, one rabies, three septicæmia, six pulmonary tuberculosis, one liver abscess, one empyema, one abortion, eighteen gastro-enteritis.

Included amongst the 5,530 third-class admissions were 203 sick convicts from the Cairo prisons. Of these, eleven were small-pox, thirteen typhoid fever, sixty-one typhus fever, twenty-four relapsing fever, two diphtheria, five mumps, two erysipelas, four Malta fever, six malaria, two pneumonia, twenty-nine influenza, twelve enteritis, eleven observation cases, and twenty-one sent in under a mistaken diagnosis.

The twenty-one convict cases admitted under a mistaken diagnosis included cases of tonsillitis, pyæmic abscesses, heart disease, gangrene, bronchitis, and skin disease.

Of the convict patients eleven died, death being due to typhus in nine cases, small-pox in one case, and pnoumonia in one case.

Ambulance Service.

During 1919 there were 3,472 calls made on the Ambulance Service. The number of journeys made by the 1st class horse ambulance was 200, whilst 300 were made by the 2nd class ambulances, 400 by the 3rd class, and 2,515 by the hooded carts.

There were also fifty-seven journeys made by the motor ambulance which was added to the ambulance equipment.

Death Inquiries.

During 1919 there were 22,309 deaths in Cairo of persons who had received no medical attendance during their last illness. So that, estimated on the 35,581 total deaths during the year, the proportion of uncertified deaths was 62·7 per cent., but as the investigations into these uncertified deaths concerned only cases of Cairo origin, the percentage should be calculated on the 31,547 deaths of persons belonging to Cairo. This would give a ratio of uncertified to total deaths of 70·0 per cent. as compared with 72·4 in 1918 and 73·4 in 1917.

The investigations were made in 16,581 cases, or 78·8 per cent. by the district medical officers; in 5,501 cases, or 24·7 per cent. by the district *hakimas*, whilst in the villages remote from, but attached to the City, 166, or 0·7 per cent., were dealt with by the sanitary barbers.

The average daily number of inquiries held in 1919 was 61·09 per cent. Of these 45·4 were held by the district medical officers, 15·07 by the *hakimas*, 0·45 by the sanitary barbers, 0·16 by the village midwives.

Vaccinations.

During 1919 there were 125,475 vaccinations carried out by the medical officers of the Inspectorate and districts.

Of these, 27,292 were primary vaccinations, 26,963 of which were on native children and 329 on children of foreign parentage. The remaining 98,183 were secondary vaccinations of persons voluntarily applying or of contacts of small-pox cases.

Of these revaccinations 35,890 were carried out by the medical officers of the Inspectorate and 62,293 by the district medical officers.

Prosecutions.

During the year 1919, 1,533 fresh prosecutions were instituted for offences against the Sanitary Laws and Regulations.

Of this total, convictions were obtained in 1,401. In fifty-one the verdict was acquittal, whilst in 132 the cases were filed.

The fresh prosecutions in 1919 were against the Vidange Regulations; for illegal practice in medicine; for failure to comply with the Vaccination Decree; for contraventions against the Regulations for Fencing Waste Lands; for failure to comply with the Regulations of January 21, 1911, and Decree No. 3 of 1918 imposing control on passengers and E.L.C. men coming from infectious countries; for the Inhumation and Exhumation of Bodies Regulations; for offences against the Infectious Diseases Law; for failure to comply with the Pharmacy and Sale of Poisons Law; for transgression of the Assistant Pharmacists Law No. 20 of November, 1911; for failure to comply with the Regulations of Births and Deaths Decree; for contraventions of the Law and Regulations governing Objectoinable, Unhealthy, and Dangerous Establishments; for general sanitary offences dealt with under various articles of the Native and Mixed Penal Codes; for offences against the *Arrêté* of June 7, 1913, regarding cleanliness of streets; for selling deteriorated meat; others were prosecutions for adulteration of milk.

Unhealthy, Inconvenient, and Dangerous Establishments.

Under the Law of August 28, 1914, and the *Arrêté* of the Ministry of Interior of August 29 of the same year, 1,511 establishments were licensed during 1919.

The small staff provided for inspection of establishments already licensed has since then been diminished by one, this latter being now employed in the Epidemic Section. As the number of "foodstuff" establishments in Cairo is about 7,000, not more than one visit per annum can be paid to the majority with the existing staff. As they are only three in number, we may assume that such rare visits can have but a limited effect in maintaining the desired standard of sanitation. It is hoped that the staff may be increased in number next year.

As before stated, dairies, confectionery establishments and bakeries gave the most frequent cause for complaint. In the greater number of these cases, objection was taken to the arrangements in force for the removal of smoke and to the infrequency with which the walls were being whitewashed.

The number of samples of aerated waters taken was 216. Of these fourteen only were found to contain lactose fermentation organisms in 10 c.c. Establishments the samples from which gave unsatisfactory results were reinspected, the conditions of the licences verified, and a time limit was given to make good any deficiencies. Failure to comply was followed by legal proceedings. At the same time the floors of such factories, the water tanks where bottles are soaked, and the storage water tanks were rewashed with boiling water under the supervision of an overseer. In nearly all cases these measures gave the most satisfactory results.

The Anti-mosquito Service.

The work carried out for the prevention of mosquito breeding was applied only in certain selected areas and quarters in which a sufficient number of inhabitants had agreed to grant access to their houses for the purpose of dealing with any breeding places.

The absence of an anti-mosquito law and the fact that no measures can be taken except those agreed to by the tenants and proprietors of houses and other buildings results in a condition of affairs that restricts very greatly the utility of the work, for the existence of a few untreated houses and gardens in any area dealt with may be sufficient to give rise to large numbers of mosquitoes that will infect the whole area. The application, therefore, of such measures in any locality is not likely to be followed by disappearance, but merely by reduction in the numbers of mosquitoes, and even then the reduction will become apparent only in those cases where the area treated is sufficiently separated from surrounding areas and does not contain a large number of untreated houses.

No great improvement is likely to occur until the onus of prevention of mosquito breeding is legally placed upon the occupiers or owners of the premises.

The number of complaints received in 1919 was insignificant owing to the following reasons:—

(i) The Nile flood was below the normal.

(ii) Most of the excavations and low-lying grounds in Cairo City, especially at Shubra, Bûlâq, and Sakakîni, which used to become flooded during high Nile, have been filled in.

(iii) The drainage work which was carried out by the Main Drainage Department on Gezîra was nearly completed and consequently the soil was comparatively dry.

(iv) Most of the houses in the treated areas in Cairo had their cesspits abolished, and their drains were connected with the City drainage system.

Sanitary Control of Public Women.

Examination Rooms for Native Prostitutes.

The maximum number of women on the register was 1,349. Of these only 982 remained at the end of the year, 367 having been struck off by the police as having left the district, being over age, &c.

The total number of examinations held was 21,829, 3,552 less than in the preceding year. That this falling off is absolute and not proportionate to the diminution in the numbers registered is shown by a comparison of the average number of examinations per woman. This was 19·1 in 1918 and only 16·2 in 1919. Even making allowance for the number of weeks spent by any woman in hospital, the figure is an unduly low one.

Diseases.—The figures dealing with disease show a decrease in proportion to the diminished attendance.

All cases of syphilis amounted to 194, or thirty-eight less than in the previous year. The decrease

is only relative, the average incidence being practically the same as in 1918.

There were 2,497 cases of gonorrhœa, acute and chronic, nearly 1,000 less than in the previous year, there being thus an actual decrease. In part at least this is attributable to more accurate diagnostic methods, for the purely clinical diagnosis of gonorrhœa hitherto relied on has been replaced by microscopic examination in nearly all cases. One result of this has been to reveal the existence of a large class of cases suffering from what may be termed "treatment urethritis." Such cases show a profuse milky urethral discharge, which on microscoping is found to consist entirely of epithelial cells, both organisms and pus cells being absent. The history shows a recent discharge from hospital. Too frequent instrumentation or the use of overpowerful caustics would cause such a condition, the urethra being left in a highly susceptible state. These cases soon become hospital habituées, and form a good illustration of the interdependence of hospital and examination rooms for indications regarding treatment and its after-effects as gathered from clinical observations.

The dictum recently uttered by a prominent authority on venereal diseases, that no more than 15 per cent. of cases of chronic and subacute gonorrhœa show the presence of the gonococcus, is abundantly supported by the microscopical findings at the examination room. Gonococci are found in practically every case of acute gonorrhœa, while their presence in the others is exceptional, and no reliance is to be placed on their absence.

For practical purposes the presence of pus cells in urethral discharge is taken as an indication of infectivity. In those cases where pus cells occur without any organism at all, the diagnosis of gonorrhœa can be made with considerable certainty. The presence of other organisms rather complicates the problem, but the circumstances render it highly probable that such are cases of secondary infection supervening on gonorrhœa, and not of non-infective urethritis due entirely to other organisms.

Cervicitis is relatively infrequent, about one in ten of all cases.

This is explained by the greater accessibility of the cervix uteri to self-cleaning. A number of cases sent to hospital as urethritis are found there to have cervicitis as well.

The total of all cases admitted to hospital was 2,788, and the percentage of examinations revealing disease 11·2 as against 13·0 in the previous year. How far this diminution can be attributed to an actually diminished incidence of venereal diseases among prostitutes is very doubtful. There is no doubt that most of the women have learnt to use the douche and other preventive measures But whether such are used merely to mislead the examining medical officer, or as a routine precaution, is an open question.

The total of unregistered women sent for examination by the police was 1,258, and of these ninety-nine were under the legal age of 18 years.

European Examination Rooms.

The total number of women on the register during the year was 437, and the number remaining on December 31 was 347.

The total number of examinations held was 15,826, which makes the average number of examinations per woman 36·2.

The percentage of examinations revealing disease was only 2·22. During the year it was realized that this figure could not represent accurately the percentage of diseased women, so the police were requested to give increased assistance, and every possible endeavour was made at the examination rooms to prevent the women from doing various things calculated by them to render detection of disease difficult, with the result that in the month of December the percentage of examinations revealing diseased conditions had risen to over 5.

Even then, however, one was faced with great difficulties. Women persist in having themselves cleaned before inspection, and some of them are so slightly and so chronically diseased that detection in the two hours that one can conveniently keep them waiting is almost impossible. It is encouraging, however, to realize that such slight cases, provided they perform an average number of douches and lavages in their houses, are probably only infective to a very slight degree.

European Lock Hospital.

During 1919 there were 389 European prostitutes admitted to the hospital for various venereal diseases.

There were eleven cases of syphilis, four of which were primary and seven secondary.

There were 332 women treated for gonorrhœa. Of these twenty-six were acute and subacute, whilst 306 were chronic.

There were also eight cases of chancroids. The remaining thirty-eight patients were admitted under observation, but proved to be free from venereal disease.

An interesting point has been observed, in the fact that reported unregistered women are practically the only class which is admitted for "labial abscess." From this it can be inferred that routine careful examination tends to give a woman more chance to avoid undesirable complications of her original trouble.

Colonial Medical Reports.—No. 133.—Egypt.

ANNUAL REPORT OF THE DEPARTMENT OF PUBLIC HEALTH FOR THE YEAR 1919.

By COLONEL CATHCART GARNER,

Director-General.

The Department of Public Health in Egypt has remained during the last thirty-four years a dependent subdivision of the Ministry of the Interior, with the result that demands for sanitary reforms have not only borne the same weight as proposals brought forward by more independent administrations, but have been forced to pass through the circuitous channels of a lay Ministry before reaching the often not too sympathetic ear of the harassed financial adviser.

It had become evident of late years that the financial and social development of Egypt called for a modification or reorganization of the sanitary and medical services which had been in vogue in 1886.

In 1918 a Commission was assembled to consider this question, and made some definite proposals to that end in a carefully prepared and weighty report.

This year a scheme to place the present Department of Public Health on a different footing has been prepared, and there is little doubt but that a change and improvement in the status and constitution of the public health administration in Egypt will be brought about in the near future.

The political excitement in the spring, culminating in demonstrations, disturbances, and strikes, resulted in a serious set-back to public health work in 1919.

Although the great majority of the Egyptian medical staff participated in the national movement and aspirations, to their credit be it said that their sense of public duty, respect for humanitarian principles, and for professional ethics, led them to report their assurance of the continuity of service at hospitals, dispensaries, laboratories, and public health offices, at a moment when practically every other branch of the service had stopped work as a sign of public protest.

Successive Directors-General and sanitary authorities in Egypt have so frequently and recurrently dwelt on the necessity for sanitary reform and reorganization that it would seem like flogging a dead horse to make further reference to the subject were it not that at last a rift in the cloud of apathy and indifference is showing, which, it is to be hoped, will spread and permit of sufficient illumination to allow the arguments and requirements of the Department of Public Health to stand out clearly for judgment and fair consideration.

The utmost apathy concerning the sanitation and conservancy of villages continues to exist amongst the people, but progress is being made in the gradual installation of water supplies to the different towns and villages.

It is evident that the Central Treasury cannot bear the expense of even the simplest and most elementary measures that could be undertaken for the sanitary improvement of the conditions pertaining in Egyptian villages. Such improvement must be carried out by local effort. Dr. P. G. S. Williams shows this clearly in a paper prepared for the Public Health Commission, in which he enumerates essential requirements as: (1) Sweeping and scavenging and watering of streets; (2) provision of public latrines; (3) disposal of garbage and excreta; (4) provision of pure drinking water supply; (5) the filling in of *birkas* and borrow pits.

There are 3,600 odd villages in Egypt. Taking No. 1 of the above enumeration and supposing that one *rais* and one sweeper only were appointed and paid by Government for scavenging work, at present rates of pay these men's wages would be, at least, L.E. 259,200 annual cost, which would not include the equipment and material, such as brushes, baskets, barrows, handcarts, water-carriers, &c. Such a small staff would, of course, be inadequate for hundreds of places, for there are nearly 1,400 villages with a population of between 2,000 and 5,000 people, 350 villages with populations between 5,000 and 10,000, and forty-one villages with populations between 10,000 and 20,000.

It is unnecessary to labour the point to show the inability of a Central Government Treasury to meet even primary sanitary needs in villages.

The sole solution is the setting up of a form of local government with local taxation and statutory obligation to undertake sanitation under the guidance and control of the Public Health authority.

During the year the Scavenging and Watering Service of the City of Cairo was detached from the Department of Public Health and handed over to the Ministry of Public Works with the idea that the Department responsible for making and repairing the roads, &c., was best qualified to attend to the cleaning and watering of them. It is, however, part of the duty of the medical officer of the district concerned to keep an eye on the work and report if not satisfactorily done.

Drainage Law.—A drainage law has been drafted by representatives of the Department of Public Health and of the Ministry of Public Works. This

law makes house connections compulsory in all towns possessing a public drainage system. The law is ready for promulgation, but has been purposely held up owing to the fact that the Ministry of Public Works report that there is such a shortage of the necessary materials in the country at present that it could not be put in force.

The inspection and control of dangerous and noxious trades has been facilitated by the publication in book form of the conditions to be laid down by licensing bodies for different types of establishments.

Steady progress has been made with the work of modernization and repair of the ablutionary and latrine accommodation in both public and private mosques. At the end of the year, 231 mosque latrines, &c., were under repair, and the number closed on account of not coming up to the requirements was 254.

During 1919 a total of twenty-six *birkas* were filled in, representing an area of nearly five *feddâns*.

General Hospitals.

The number of Government hospitals remains the same as last year: twenty-four.

Financial considerations have until now precluded the rebuilding of a suitable institution, but at last a move has been made, a credit has been opened, a committee of practical men—medical, engineering, and financial—has been appointed, has selected a site, and plans for a modern hospital of 1,200 beds are to be put to open competition by architects of renown and with experience in modern hospital construction.

The erection of this new hospital will allow of a great extension of the School of Medicine, and of the opening of a Dental School so badly needed in Egypt, together with an enlargement of the School of Pharmacy.

Messrs. Thos. Cook and Son have generously offered to present their hospital at Luxor—freehold site, building, and equipment—to the Government on certain conditions of upkeep, &c. This hospital, when repaired and opened, will serve the needs of a large district with a population of some 50,000 people.

Ophthalmic Hospitals.

The attendance at the ophthalmic hospitals continue to be most satisfactory and the work carried out by the eighteen hospitals is highly appreciated by the people.

The two chief diseases dealt with are trachoma and acute contagious ophthalmia, the latter being the chief cause of blindness in Egypt. More than 12,000 of the persons who sought treatment at the hospitals in 1919 were blind in one or both eyes, i.e., 15 per cent. of new patients.

It is interesting to note that the importance of early treatment for children attacked by ophthalmia is now being recognized by the people, who readily bring their children to the hospital for treatment.

Children's Dispensaries.

The Children's Dispensaries or Child's Welfare Bureaux started in 1913.

A disposition on the part of certain Provincial Councils to close down these children's dispensaries has been recently evinced, generally on the plea of insufficient funds. This intention has been met by general opposition on the part of the public as indicated by various protests in the native and European Press. It is obvious that the closure of these institutions in a country where the infant mortality is so high would be a retrograde step, and the Provincial Councils concerned were officially expostulated with by the Central Government pointing this out and emphasizing the unfavourable light in which they would appear, *vis-à-vis* other countries, where this work, far from being reduced, is being extended and pressed forward with the greatest vigour. Stress was also laid on the educational force exercised by these institutions on the mothers and children attending them.

There also appears to be a desire to convert the dispensaries into hospitals in the charge of Egyptian doctors and to introduce the system of collecting a small fee from each patient. It is not improbable that the presence of a male doctor in these places would have the effect of frightening away a large number of mothers who now unhesitatingly accompany their children and thus obtain valuable lessons in cleanliness, personal hygiene, &c.

Infectious Diseases.

With regard to epidemic diseases in 1919, one feature to be noted is the increase of the death-rate of most of the important infectious diseases caused presumably by non-reporting of cases due to the disturbed internal conditions in the spring and early summer.

It may be noted that the death-rate of typhus fever cases was 32·8 per cent. in 1919, compared with 26·4 per cent. in 1918. The number of small-pox cases recorded in 1919 is the largest during the last ten years. A vaccination campaign was at once begun. The number of persons revaccinated during the year was 2,500,000, and at the time of writing this report (May, 1920) over 6,000,000 people have been vaccinated. In the course of the work many concealed cases of disease were discovered in villages by the vaccinating gangs. The total number of cases of small-pox found and reported was 7,895; of this number 1,926 died, giving a mortality rate of 24·39 per cent.

Malaria.—A severe and fatal epidemic of malaria occurred in Markaz El Derr, inhabited by a poor population, living on the narrow strips of cultivation on each side of the Nile.

The various Sub-Committees appointed by the Anti-Malaria Commission continued their work, though considerable delay on account of the revolution in the spring was reported.

Influenza.—The epidemic which appeared in the country in May, 1918, lasted until February, 1919. It was then made compulsory by law to notify to this Administration cases of influenza.

Plague.—Of the 877 cases occurring in 1919, sixty-four were septicæmic, seventy-six pneumonic, and the rest bubonic.

Anthrax.—Cases of anthrax having occurred amongst British soldiers in August, due it was supposed to the use of shaving brushes, investigations showed that these brushes had arrived from Kobe, Japan. The suspected consignment was traced, and bacteriological examination proved the presence of anthrax bacilli. The consignment was destroyed.

Prior to the war the trade in cheap shaving brushes was practically a German monopoly, and in that country adequate precautions were taken to disinfect the horsehair from which these brushes were made. Hair used in the brushes made in Japan comes, it is understood, chiefly from Chinese sources: a type of hair notoriously known to be infected with anthrax.

Ankylostomiasis and Bilharziasis.—Steps have been taken to reopen the campaign against these two diseases. An Anglo-Egyptian Committee has the matter in hand and is drawing up a comprehensive scheme.

Venereal Diseases.—Under the system at present in vogue for controlling venereal disease in Egypt, 171,243 examinations of prostitutes were carried out throughout the country, with the result that 6,192 women were found to be infected either with syphilis or gonorrhœa. Of course it is unnecessary to state that these figures do not by any means represent the amount of venereal disease existing in the country, as they only refer to the notorious class of *femmes publiques* registered by the police.

Pilgrimage.

Owing largely to the continuance of war conditions, the total pilgrimage to the Hedjaz comprised less than 1,000 people. Of these, 444 were ordinary pilgrims and 420 were members of the Mahmal escort and staff. All these pilgrims were inoculated against cholera. No deaths occurred, and on return to Suez only four pilgrims were found to be ill.

Now that hostilities have ceased it becomes of interest to ascertain whether or not it might be possible to initiate measures for an improved water supply, conservancy, and hospital accommodation for pilgrims at Mecca. The unenviable hygienic reputation acquired by Mecca and the Hedjaz has been only too well earned. A cholera infection in the Hedjaz and holy places of Arabia spreads like wildfire, and is an undoubted source of anxiety to the sanitary authorities of all countries who may have furnished quota of pilgrims proceeding to or returning from Mecca, &c.

It is interesting to note that in the past Egyptians have been largely instrumental in keeping in repair the Mecca water supplies. Egyptian enterprise and money have bulked largely in the past in connection with this matter.

Public Health Laboratories.

It is to be observed that with the exception of the City of Alexandria the bacteriological diagnosis for the whole of Egypt is centralized in Cairo. This is disadvantageous as regards certain bacteriological diagnoses, such as those required for the control of plague, typhus, &c., and also as regards certain chemical analyses, and those of distant local water supplies, aerated water and ice, on account of the time taken for the specimens to reach the Central Laboratory in Cairo. It is therefore proposed to extend the facilities for bacteriological diagnosis to certain towns in the provinces, such as Suez, Port Said, and Asyût. Bacteriologists are being trained at the Central Laboratory to staff these provincial laboratories, and the necessary funds for their installation and equipment are being asked for.

Pharmacies.

During the year 1919 authorizations to practise their trade were given to nineteen pharmacists, of whom only two were holders of diplomas from the Qasr el 'Aini Medical School. There is a considerable shortage of qualified pharmacists; there are at present seven such vacant posts in the Government, and it is impossible to find candidates to fill them.

Attention is drawn to the traffic and smuggling of narcotic drugs, which the law at present appears to be powerless to stop. The illicit traffic still exists to a very large extent.

Although a decree was published in 1915 to prohibit the cultivation of poppies, a considerable amount of opium is regularly cultivated, as cultivators openly apply for permission to transport it to the towns for disposal. The penalties inflicted by the courts on offenders against the law on narcotics and soporifics are ridiculously inadequate. One example will serve to prove this assertion. The Inspectorate of Pharmacies proved conclusively that a certain pharmacist in Cairo had disposed of a considerable quantity of cocaine and morphine illegally, and had attempted to justify his action by altering and forging doctors' prescriptions by converting grains into grammes and by altering the figure 1 into 10. After a lapse of nearly two years a judgment of P.T. 100 fine and costs was obtained against the delinquent.

SECTION I.

General Sanitation.

Vital Statistics.

In the report for last year, the occurrence of an excess of deaths over births was recorded, a very unusual state of affairs in Egypt.

The general rates for the whole country are:

Birth-rate, 38·0 per thousand; death-rate, 30·0 per thousand.

During the year considerable evidence was collected, showing that the formidable increase in the prices of practically every article of food was having a very deleterious effect on the health of the population, especially the lower classes, as it was proved that the revenue of many families was quite insufficient for the purchase of an adequate supply of even the cheapest and simplest articles of food. These facts were brought to the notice of the authorities; energetic measures were taken, especially as regards the sale of flour at reasonable prices, and a great improvement in the food conditions of a large section of the population was brought about.

Unhealthy, Inconvenient, and Dangerous Establishments.

During the year a serious attempt was made to reorganize the work performed by the Department of Public Health.

The publication of the "Model Conditions" has proved a great boon to the medical officers employed in this licensing work. It shows them what the policy of the Department is as regards each type of establishment and the special points as regards each establishment on which the Department lays emphasis.

In many cases it is quite impossible to apply the new model conditions to old establishments already licensed without practically pulling down the old building and reconstructing it anew.

The proper registration of *établissements insalubres* has long been a crying need; formerly, the medical officer, after laying down conditions for an establishment, had no record of it, and the result was that he could never tell how many establishments of any given kind he had in his district, nor were routine inspections possible. Now all establishments are registered, and an index is kept grouping similar establishments together, so that a medical officer wishing, for example, to inspect dairies in his district, has only to turn up this index and he finds a complete list giving the names of the proprietors and their addresses.

The appointment of special inspectors to work under medical officers was also a necessity.

Thirteen posts have already been granted, and it is hoped to add to their number annually until there are altogether twenty-two of them and a chief inspector attached to the Central Administration to supervise their work.

SECTION II.

General Hospitals.

General.

In general the policy of this Section has remained unchanged since last year, and no developments of outstanding importance have been undertaken.

An X-ray plant was installed in Damanhûr Hospital during 1919.

The shortage of pharmacists has made it difficult to grant leave as freely as it could be wished owing to the difficulty of providing reliefs. It is hoped that this will be rectified in the future.

The present class of hospital storekeepers is on the whole not satisfactory. In order to get suitable men it will be necessary to require a higher standard of education and technical knowledge, which will entail an improvement in their status.

Children's Dispensaries.

All the dispensaries were working at the commencement of the year, but owing to the disturbance in March only Port Said, Zagazig, Damanhûr and Wasta were able to remain open; all the others being closed for periods varying from a few weeks to six months.

The attendances remain high, and there is no diminution in the appreciation of the poor women for the advice and treatment received.

Some adverse criticism has lately been directed against the dispensaries. The critics are anxious to convert the dispensaries into hospitals in the charge of a doctor, charging a small fee. This would entirely alter the function of the dispensaries and convert them from infant welfare centres where the teaching of cleanliness, correct feeding, and clothing is the main object, into out-patient cliniques. This work is essentially women's work, and throughout Europe is successfully carried on by nurses, assisted greatly by voluntary workers from among the residents.

Schools for Dayas and Maternity Homes.

The improved method of selection of candidates is bringing in a better and more receptive type of pupil, the standard of intelligence in the Delta towns being considerably above that of the women in Upper Egypt.

Considerable public interest is being taken in the need for an improved type of midwife in the country, and it is hoped that by the passing of a Midwives Act and the opening of a Cairo Training Centre many reforms may be carried out.

The medical help given by the doctors to the schools is much appreciated both in difficult cases and in lectures. It is gratifying to note the results of training in the earlier recognition of abnormal presentations and complications, and thus help is sought during the first stages of labour, and not only after many days have elapsed and the patient is practically moribund.

Many women still apply for treatment for gynæcological troubles, and in some districts the proportion of women suffering in this respect is estimated at about 70 per cent. The prejudice against seeking assistance at a general hospital is still very strong.

Colonial Medical Reports.—No. 133.—Egypt *(continued).*

SECTION III.

Ophthalmic Hospitals.

The need for ophthalmic treatment has two entirely separate origins. The first is the prevalence of a chronic disease of the membrane lining the eyelids, trachoma, and the other is a group of acute contagious ophthalmias which are the main cause of blindness in Egypt. More than 12,000 patients who sought treatment at the hospitals during 1919 were blind in one or both eyes. The clinical research work which is being carried out at the ophthalmic laboratory, at the ophthalmic hospitals, and at the ophthalmic clinics of each of the Government primary schools all over Egypt, should eventually shed some light on prophylactic measures. The importance of obtaining treatment for babies and children attacked by ophthalmia is beginning to be recognized by the people; more than 6 per cent. of all patients treated were under the age of 1 year, and 39 per cent. were under the age of 15 years.

The provision of a special ophthalmic hospital for Cairo is urgently required. There is insufficient ophthalmic out-patient relief available for the thousands in Cairo who suffer, more especially during the hotter months, from painful and destructive diseases of the eye. It is impossible with the existing hospital facilities of Cairo to cope with the vast number of patients who come to hospital demanding operations to relieve inward growing eyelids and eyelashes, one of the cicatricial results of trachoma; 24,611 such operations were performed at the ophthalmic hospitals on out-patients and cured during the year.

SECTION IV.

Infectious Diseases.

Typhus Fever.—The declension in the number of cases in 1919 is considerable, but the position is not so satisfactory as this difference if taken by itself would indicate, for the death-rate has risen from 26·4 per cent. to 32·8 per cent. There is no reason to believe that the disease has taken on an increased severity, and this rise in the death-rate is probably due to non-notification of cases as a result of the disturbed condition of the country during the spring and early summer, the period at which this disease is at its height.

Small-pox.—This disease assumed an unusually high incidence in February. A vaccination campaign was at once begun, but owing to the disturbances in the country and the interruption of communications this campaign was stopped.

The number of cases reported in 1919 is the largest during the last ten years.

Malaria.—A very severe and fatal epidemic of malaria occurred in Derr during 1919.

The first intimation the Department received that there was a fatal epidemic in Derr Markaz was the fact that the death-rate had increased in this Markaz. Reports gave the cause of the epidemic as being either influenza or malaria. It may be noted here that this district was not as heavily infected with influenza during the outbreak of 1918-1919 as the rest of Egypt. A large number of blood films which showed positive malaria were received by the Central Laboratories during November and December, 1919. It was also noted that among the blood films were some taken from women. Berberine women do not travel far and seldom leave their own villages. This helped to strengthen the suspicion of a local and very fatal epidemic of malaria.

One of the divisional inspectors of the Department established the diagnosis of malaria and found practically the whole of the Markaz south of Derr town infected and the death-rates enormously increased. Abu Simbel, the most heavily infected place, had a death-rate for November of over 400 per thousand of the population per annum.

Active treatment of the sick with quinine was started. Distributors of quinine were appointed in the infected districts. Large supplies of milk and arrowroot were sent. Reluctance to take quinine on the part of the inhabitants (specially women) had to be overcome. The breeding places of the mosquito were found in irrigation wells and *zirs*. Anti-mosquito measures were actively carried out.

In the area infected are seventeen districts on one or other side of the river. No district escaped infection, but the degree of infection varied. In a few the infection was light. In many places so many of the inhabitants were ill that all work stopped in the fields. In one place (Ibrim), even the dead lay unburied in houses for two or three days as there were no able-bodied people to dig graves and bury them. There is no evidence to show that the disease was imported to any district either from the Sudan or from Palestine.

Influenza.—In February, 1919, the disease was made compulsorily notifiable. The main reason which led the Department to obtain the necessary legal power was that, with the advent of the typhus fever season overlapping the end of the influenza epidemic, there was a possibility of typhus fever being diagnosed as influenza to escape the obligation to notify.

Plague.—The total number of declared cases of plague in 1919 was 877.

Of these, 737 cases were of the bubonic, sixty-four of the septicæmic, and seventy-six of the pneumonic type.

Anthrax.—On August 10, 1919, the Army authorities notified the Department of Public Health that cases of anthrax had occurred among soldiers due to the use of shaving brushes.

Investigations made showed that these brushes were received from Kobe, in Japan.

The Department at once traced the suspected consignment, and as the bacteriological examination of specimens taken from them proved the presence of anthrax bacilli, they were destroyed.

The Public Health Laboratories.

The whole question of the arrangement of Government laboratories and the co-ordination of their work is at present being studied by a small Government committee, of which the Director of the Public Health Laboratories is a member.

The rôle of the Public Health Laboratories has been confined to giving help where necessary, as in the performance of a number of Wassermann reactions and the supply of certain chemicals, bacterial cultures, sera, &c.

The time is rapidly approaching when some arrangement must be made to extend the facilities for bacteriological diagnosis to certain towns in the provinces. With the exception of the City of Alexandria, the bacteriological diagnosis for the whole of Egypt is centralized in Cairo. Under this arrangement certain bacteriological diagnoses, such as diphtheria, are impossible for many parts of the country, owing to the distance from Cairo, and, apart from this difficulty, the wholesale centralization of the work is not altogether advantageous as, in the first place, there is necessarily a considerable delay in the transport of specimens, and, secondly, many of the examinations which have a definite local interest, such as the examination of water supplies, aerated waters, ice, &c., should undoubtedly, where possible, be carried out locally.

The laboratories are constantly referred to by the different services of the Department of Public Health and other Government administrations for advice and assistance on various questions of a scientific nature. This branch of the activities of the laboratories is becoming increasingly important and occupies a considerable amount of the time of the Director and Sub-director.

Bacteriological Section.

The occurrence of two cases of malignant pustule which occurred at Qantâra and were traced to anthrax-infected shaving brushes led to the examination of a large number of shaving brushes obtained from various sources in Cairo and elsewhere and to the regular examination of all consignments of shaving brushes imported into Egypt. A large number of the brushes from Japan were found to be infected with anthrax. As previous to the detection of the import of infected brushes into Egypt many of these had doubtless come into the country, the public was warned of the risk of using such brushes, and was advised of a method of sterilization best adapted to minimize the risk.

The Weil-Felix reaction has been carried out on the blood of a number of cases of definite typhus fever under observation at the Government Fever Hospital at 'Abbâsiya. This reaction, being found to be positive in some 70 per cent. of cases of typhus fever, is now of considerable diagnostic value, and is being carried out as a routine practice in the laboratory.

A strain of typhus virus obtained from a patient on February 25, 1917, has been regularly passed through guinea-pigs, and at the end of the year had reached the ninety-first passage. So far the strain has shown no marked change in character as the result of continued passage, and does not appear to have undergone any increase of virulence for the guinea-pig.

Vaccine Institute.

In the autumn of the year, it having been found necessary by the Department to undertake an extensive campaign of general vaccination at short notice, very large demands were suddenly made on the Vaccine Institute. The institute is designed for an annual output of some two million doses of vaccine for Egypt and the Sudan, but for the proposed campaign an output of one million doses per month for a period of six months was considered necessary.

Temporary matting stables were erected at the institute and the necessary vaccine was prepared. The glass tubes and phials for the dispatch of the vaccine were not available, so that for a time the vaccine had to be distributed in such small medicine bottles as were locally obtainable.

As the Vaccine Institute has no arrangement for cold storage, the vaccine is stored in a cold storage room. The temperature of this room is not suitable for the keeping of small-pox vaccine; a rise in the temperature of the storage room having given rise in 1918 to a diminution in the activity of the stored vaccine, rendering it unsuitable for issue. It has not yet been possible to arrange for storage at the desired temperature.

Antirabic Institute.

In 1919 a total of 1,010 persons were treated in the institute. From this number the following deductions should be made:—

Four persons who ceased to attend for treatment without a satisfactory reason.

One hundred and thirty-six persons whose treatment was discontinued as being unnecessary, the observation of the animal for a period of ten days or more having shown it not to be rabid.

Ten persons whose treatment, although completed, must be considered useless, the animal inflicting the bite having proved healthy by inoculation of rabbits.

The injuries to the 860 patients were inflicted in 725 cases, by dogs; 36, cats; 49, wolves; 4, monkeys; 10, donkeys; 9, horses; 1, mule; 5, camels; 20, jackals; 1, rabid human being.

The number of persons bitten does not correspond to the number of animals causing the bites reported, as in several cases one animal caused the injury to more than one person.

Rabies was considered to be proved in the case of forty-eight animals, having bitten ninety-eight persons. The diagnosis was determined:—

By veterinary inspectors in the case of twenty-five animals (twenty-three dogs, one cat, and one wolf), having bitten fifty-six persons.

By rabbit inoculation in the case of twenty-three animals (twenty dogs and thee cats) having bitten forty-two persons.

In the case of fourteen animals, having bitten twenty-two persons, positive diagnosis of rabies is presumed by the death of one or more of the patients bitten.

In addition to the above, it is necessary to record the death of fifteen other persons who died either during treatment or less than fifteen days after its completion. The gross mortality comprising all deaths is therefore 1·7 per cent.

APPENDIX I.—NOTE ON THE DESIRABILITY OF EXTENDING THE FACILITIES FOR BACTERIOLOGICAL DIAGNOSIS TO CERTAIN TOWNS IN THE PROVINCES.

The bacteriological diagnosis for the whole of Egypt, except the city of Alexandria, has up to the present been carried out entirely in the Public Health Laboratories in Cairo. Under the circumstances this has hitherto perhaps been unavoidable, but during the last few years the demands for such diagnosis have increased to so large an extent that the question of some degree of decentralization should now be considered.

Among the disadvantages of the existing arrangement the following may be specially noted:—

(1) Certain bacteriological diagnoses, such as diphtheria, are impossible for many parts of the country owing to the distance from Cairo. In such cases specimens are either useless on arrival or liable to give misleading results.

(2) A large number of examinations of films collected in Upper Egypt in connection with the control of typhus, plague, &c., are regularly sent to Cairo for examination. Owing to the time occupied in transport, examination and the necessory formalities of registration, &c., some delay is inevitable, and the results when they reach their destination are much less valuable than if they had been immediately available. In the case, for instance, of a death from suspected pneumonic plague, the results of the immediate examination of a film from the lungs are often invaluable to the medical officer in charge, and enable him to decide at once on the necessary course of action.

(3) The regular bacteriological control of water supplies at a distance from Cairo is at present impracticable, as specimens sent to Cairo from these supplies are useless for bacteriological examination unless sent carefully packed in ice, which necessitates their being sent by hand.

(4) The locally manufactured aerated waters cannot be adequately controlled.

As a first step towards a better provincial diagnosis service, it might be well to consider the advisability of establishing small centres in one or two suitable provincial towns, and for this purpose in the first instance Port Said, Suez, and Asyût would be the most suitable.

Pending a decision on the future of the Quarantine Board such arrangement in the case of the two former towns would necessarily be of a more or less provisional nature, but this need not stand in the way of a beginning being made.

Port Said.—The case of Port Said, with its port and considerable European population, is particularly urgent, and the work would occupy the whole time of at least one bacteriologist. He would, in the first instance, undertake the diagnosis of diphtheria for the town, and would carry out the microscopical examination of films for plague, malaria and relapsing fevers, and make the agglutination tests for enterica and Malta, as well as carrying out any diagnosis work required for the Government Hospital. He should be responsible for the bacteriological examination of the locally prepared aerated waters, the examination of rats for plague, and, in short, all the simpler bacteriological work of the Public Health Service; the more complicated and difficult examinations, such as cholera, being still referred to the Central Laboratories in Cairo.

A most important question in Port Said is the milk control, particularly in connection with the question of Malta fever. Malta fever has for many years been endemic amongst the milch goats in Port Said, and some years ago a serious attempt was made by the Deparement to deal with this question, the blood of all the goats in Port Said being examined, and such goats as showed a positive agglutination of Malta fever being killed. Unfortunately, it has not been possible to continue this work, but with the presence of a bacteriologist in the town this examination might be resumed, and there is no reason why the disease should not be stamped out.

In order to deal with the question of adulteration of milk it is desirable that regular chemical analysis should be undertaken locally. This should not be beyond the powers of the bacteriologist who, previous to taking up his duties in Port Said, might undergo a course of training in the chemical analysis of milk in the Public Health Laboratories in Cairo.

Suez.—In the case of Suez the same arguments hold, but being a much smaller town, the necessity for a local diagnosis service is less urgent than in the case of Port Said.

Asyût, lying as it does practically in the middle of the long stretch of Upper Egypt, is probably the most suitable centre for a laboratory south of Cairo. The railway journey from Aswân to Cairo (886 kilometres) takes over twenty hours by express, so that specimens forwarded by letter post take, as a rule, not less than forty-eight hours to reach the laboratories in Cairo, and may take considerably longer.

A laboratory in Asyût (378 kilometres from Cairo) could undertake most of the simpler work from the Province of Asyût and from all stations south of this. The amount of work in Asyût would probably be sufficient to at once occupy the whole time of one bacteriologist.

As regards the Question of Accommodation.—In the case of Port Said and Suez the Quarantine Board already has laboratories in both towns and, in the event of this service being taken over by the Department of Public Health, the bacteriological

diagnosis could be carried out in these laboratories. Pending the taking over of the quarantine work, a similar arrangement could be made, or the work could be carried out in the newly erected laboratory at the Government Hospital.

The importance of Asyût from its geographical position certainly warrants the erection of a laboratory. This will have to be provided sooner or later, and it would probably be more economical to proceed with it without delay. One or two rooms would suffice as a beginning, but it is most important that these should be so arranged as to form part of a definite plan which could be completed when the necessary funds are available.

As regards the necessary Staff.—In the case of Port Said and Suez, when the quarantine work is taken over, the Department would have to maintain well-equipped laboratories in both these ports. As these laboratories must be under the charge of capable men and will be able to undertake all varieties of bacteriological work, there would be no difficulty in attaching an extra bacteriologist to each laboratory for the public health work of the town. This man would then work directly under the director of the laboratory in Port Said or Suez, both these laboratories being under the ultimate control of the Public Health Laboratories.

In the case of Asyût, the bacteriologist appointed should be a man who has undergone a course of training in the Public Health Laboratories in Cairo. He would be nominated with the approval of the Director, Public Health Laboratories, Cairo, and would be controlled by him as regards his scientific work only. The Asyût laboratory should be the forerunner of a series of laboratories in the larger Egyptian towns, and it is very necessary, for the maintenance of a high standard of work, that such laboratories should be controlled by the Central Laboratories in Cairo, and be regularly inspected by a senior bacteriologist from these laboratories, but I am of the opinion that such control should be limited to the technical aspect of the work, and that administratively they should depend elsewhere.

The Central Laboratories in Cairo are essentially a technical institution, and it is undesirable that they should in any way tend to assume the functions of an administrative section of the Department.

With the extension of local government in Egypt, many of the larger municipalities may find it necessary or desirable to establish laboratories, not only for the services of the municipality, but also for the assistance of private practitioners, and the Government would do well to encourage development along these lines. It is, however, essential to the success of such arrangements that the Government should exercise a thorough control of such laboratories not only by means of regular inspection but by insisting on the right to nominate the personnel. These powers might be secured by the provision of " grants-in-aid " or other suitable administrative arrangements.

In the *other Egyptian towns where Government hospitals exist* a good deal might be accomplished. The hospital section of the Department of Public Health has, I understand, set aside a room in each hospital, and is fitting it up as a small clinical laboratory.

I am convinced that, as time goes on, these laboratories will become increasingly valuable to the Department, and feel that no effort should be spared in increasing their usefulness. To refer only to the question of bilharziosis, with which some 60 per cent. of the population is stated to be infected, very promising results have recently been obtained in the treatment of this disease with antimony tartrate. The treatment is at present on trial and could not yet be recommended for general use, but the results so far obtained appear to warrant the conclusion that the parasite is susceptible to medicinal treatment and that a suitable drug will ultimately be found. Whatever drug is finally employed for this purpose, it will be necessary to control the treatment either by the examination of the urine and fæces or by blood examinations, and this will involve work on a considerable scale for which purpose local laboratory facilities will be necessary. The same remarks apply to the treatment of ankylostomiasis.

The development of the laboratories of the provincial Government hospitals could be arranged by the appointment of a fourth-class medical officer, with the necessary training, as pathologist to each hospital. This man would carry out all the clinical pathological and bacteriological work of the hospital, and it might be arranged that he should also undertake the simpler diagnosis work for the town. The extent to which this is desirable would be a matter for the decision of the Department.

In any case the equipment of the hospital laboratories should be completed so as to render them capable of dealing with the necessary work If this arrangement is adopted, I would suggest that the pathologists should be administratively under the Hospital Section of the Department, but that they should be technically controlled by the Central Laboratories in Cairo, which should arrange for the inspection of these hospital laboratories and control the scientific work of the pathologists who, before taking up their duties, would have served for the necessary period in the Public Health Laboratories in Cairo.

(Signed) C. Todd,
Director, Public Health Laboratories.
September 3, 1919.

Colonial Medical Reports.—No. 133.—Egypt (*continued*).

APPENDIX II.—ABSTRACT OF REPORT ON THE WORK CARRIED OUT BY THE BACTERIOLOGICAL LABORATORY AT JEDDAH FROM AUGUST 11 TO OCTOBER 31, 1919.

The establishment of a bacteriological laboratory at the Quarantine station at Jeddah is mainly due to the initiative of the British Agent of the Hedjaz. The object of the laboratory is the performance of all examinations of suspected cases amongst the pilgrims, especially on their arrival at, and their departure from, the holy places.

The staff consisted of a bacteriologist, a clerk, and a laboratory attendant.

The equipment of the laboratory proved in practice very satisfactory.

The specimens received for examination were either from pilgrims or from the natives of Jeddah. In the first case, they were sent by the quarantine doctor; in the latter, by the British Agency doctor.

The specimens were handed on arrival to the clerk for registration. The result of examination was reported to the doctor either verbally or by telephone.

The laboratory was favoured with the visit of Emir Abdalla, son of His Majesty the King. A demonstration of some micro-organisms was made before him, at which he expressed his interest and satisfaction in the kindest words.

I should like to mention the solicitude and interest shown by Major Marshall (Inspector of the Hedjaz Quarantine) to the laboratory and the many services he rendered to its staff, making their task easy and pleasant.

Thanks are also due to the laboratory assistant, Mohammed el Hawâry, for the great care and skill he showed in the performance of his duties.

(Signed) ALI TEWFIK SCHOUSCHA,
Bacteriologist, Public Health Laboratories.
November, 1919.

INSPECTORATE OF PHARMACIES.

The traffic in and smuggling of narcotic drugs still continues on a very large scale. The control exercised by the Inspectorate in conjunction with the Customs Administration over the importation of these drugs has resulted in a marked decrease in imports. This concerns the quantities used in legitimate medicine. On the other hand, the traffickers still succeed in getting large quantities into the country.

The penalties inflicted by the law are ridiculously inadequate in comparison to the harm done by these traffickers, and also in comparison to those penalties which are inflicted in most European countries which are doing their utmost to eradicate this evil.

The work of the Inspectorate of Pharmacy is steadily increasing, and its sphere of usefulness could be increased if a larger staff were available.

AUTHORIZATIONS TO PRACTISE MEDICINE AND ALLIED PROFESSIONS.

The law as it at present stands allows the Department of Public Health to license the holders of diplomas from any recognized faculty or university to practise in Egypt, but the appreciation of the value of certain of the diplomas presented is found to be exceedingly difficult, and in some cases deliberate fraud has been brought to light.

An Ottoman Jew, who qualified in medicine at the Constantinople Medical School during the war, was pressed by the Turkish authorities to enter the Turkish Army. He demurred, whereupon his diploma was made out bearing an Osmanli name instead of his real name, and he was mobilized. In due course he arrived in Egypt, and applied for permission to practise his profession; on examining his documents, it was found that the name on his identification papers differed from that on the diploma. After long inquiries the above facts were elicited.

A Persian diploma, stated in the first instance by the Consular authority concerned to be valid, was subsequently stated by the same authority to be not valid.

Other cases have occurred in which the original name on a diploma has been changed after the death of its owner by the person into whose possession it has come, with the object of converting the diploma to his own use and obtaining permission to practise as a doctor on the strength of it.

Again, as a result of the peculiar conditions arising from the state of war, members of the various professions under notice, refugees from their own countries, have been unable to produce their original diplomas or other necessary documents, but have been able to prove that they are fully and properly qualified. In these cases the Administration has granted temporary permits to practise, with the proviso that the original documents must be produced as soon as the state of affairs allows, otherwise the permit to practise will be withdrawn.

The new law on the practice of dentistry, which is on the point of being promulgated, gives power to the Administration to insist that the holders of doubtful diplomas who apply for permits to practise should submit to an examination by a Board of Examiners appointed by the State. It is intended to insert the same powers in the projected new laws on the practice of medicine, midwifery, chemistry and pharmacy.

Colonial Medical Reports.—No. 134.—Bengal.

ANNUAL RETURNS OF THE LUNATIC ASYLUMS IN BENGAL FOR THE YEAR 1919.

By the Honourable MAJOR-GENERAL W. H. B. ROBINSON, C.B., K.H.S., I.M.S.

Surgeon-General with the Government of Bengal.

The total capacity of the lunatic asylums, including the Bhowanipur Observation Ward, was 1,099 (901 males and 198 females) as compared with 1,170 in 1918. The abolition of the Bhowanipur Lunatic Asylum and its replacement by the temporary observation ward for six patients and the recalculation of the capacity of the Berhampur Asylum by a fresh survey at 50 superficial feet per patient, account for the difference. There was a slight overcrowding in the male side of the Dacca Asylum, the largest number confined on any one night having been 284 against a sanctioned capacity for 274. In the new building now under construction at Bhowanipur provision has been made for the accommodation of thirty observation cases.

The year opened with a total of 1,007 lunatics (864 males and 143 females) under treatment. There were 247 admissions (204 males and 43 females) during the year, including ten readmissions. The total number of insanes treated was thus 1,254, the daily average strength being 997. The maximum number confined on any one night was 1,028 (877 males and 151 females). The decrease in the population is mainly due to the lesser number of military insanes admitted, as well as smaller transfers from other Provinces.

There were twenty-four private patients at Berhampur during the year, nine of whom were new admissions. At the close of the year there remained eighteen, four having been discharged and two having died.

The duration of insanity prior to admission of the patients admitted during the year was ascertained in eighty-six cases only; twenty-nine are reported to have been suffering for less than three months, fifteen from three to six months, seven from six to twelve months, and thirty-five from one to several years.

The total number discharged was 171. Of the discharges ninety-four cases were cured, twenty-seven improved, twenty not improved, and thirty (most of whom were observation cases) discharged otherwise. The proportion of cases cured was 9·43 per cent. of the total strength.

Of the ninety-four cases cured, forty-nine (thirty-eight males and eleven females) suffered from mania, twenty-nine (twenty-seven males and two females) from melancholia, two males from delusional insanity, one male from post-febrile insanity, one male from confusional insanity, two males from alcoholic insanity and ten males from insanity caused by *Cannabis indica*. The duration of insanity of the cases cured prior to admission was ascertained in forty cases only as follows:—

Less than three months, 23; three to six months, 7; six to twelve months, 4; over one year, 6; total, 40.

The average stay in the asylums of the patients cured was one year seven months and eleven days at Berhampur, and four years eight months and nine days at Dacca, the shortest and longest being one month and eight days and sixteen years four months and twenty days respectively at Berhampur, and one month and four days and thirty years four months and twenty-two days respectively at Dacca.

The general health of the asylums was unsatisfactory. The chief causes of sickness were dysentery, diarrhœa, malaria, anæmia, influenza, and pneumonia. Tubercle of the lungs was, however, conspicuously on the decrease, and cholera and small-pox were absent except for a solitary case of the latter at Berhampur, which was cured.

One hundred deaths occurred during the year, the ratio per cent. to average population being 10·03. The heavy mortality is due to an epidemic of influenza at the Berhampur Asylum causing sixteen deaths, and the bad health of a large number of new admissions both at Dacca and Berhampur.

Stool examination of the lunatics for the detection of hookworm disease was done during the year at the Berhampur and Dacca Asylums, and ova of hookworm were found in 116 cases (fifty-six at Berhampur and sixty at Dacca). These cases were treated with either thymol or chenopodium oil, followed by saline purge. The results are reported to be satisfactory at both the asylums, except for one death which occurred at Dacca.

It is satisfactory to note that there were no escapes from any of the asylums during the year, and that there were no cases of injuries except of a trivial nature.

Admissions for observation numbered fifty, viz., twenty-five in Bhowanipur Observation Ward, twenty in the Dacca, and five in the Berhampur lunatic asylums. Besides these there was one case of the previous year at Bhowanipur. Of these fifty-one cases, nine were pronounced to be sane and discharged, twenty-nine were certified to be insane and admitted into the asylums (eleven of them were transferred to the Ranchi Asylum from Bhowanipur), and ten were disposed of as follows: Four handed over to their relatives, two made over

to, and one discharged by the order of the Committing Magistrate, and three discharged otherwise.

The criminal population of the asylums consisted of 488 males and forty-one females, 529 in all, fifty-eight of them (fifty-two males and six females) were new admissions. Forty-one criminal lunatics were discharged, thirty-two died, and five were transferred to the non-criminal class on the expiry of their sentences. At the end of the year there were left 451 lunatics of this class in the asylums (416 males and thirty-five females) classified as under:—

Under-trial (criminal I)	...	233
Tried and acquitted (criminal II)	...	154
Convicts (criminal III)	...	64
Total	...	451

The principal offences with which they were charged are murder (203) cases), culpable homicide not amounting to murder (45 cases), grievous hurt (60 cases), theft (38 cases), house trespass (24 cases), attempt to commit murder (12 cases), attempt to commit suicide (7 cases), criminal trespass (6 cases).

At Berhampur 402·66 lunatics were on an average employed on industrial work, viz., 61·85 on weaving, 43·33 on gardening, and 297·48 in dairy, bakery, looms and oil mills, &c. The bakery and the looms continued to be useful and profitable.

The daily average number so employed at Dacca was 72·38. Weaving, tailoring, cane-work, oil mill and carpentry are the regular useful industries in this asylum.

As lunatics are not made to work so steadily and systematically as convicts in jails, they being engaged in work merely to have their time occupied and thus to keep them from mischief, the outturn of lunatic labour cannot be estimated by the numerical strength of the persons employed.

As usual every attempt was made to keep the lunatics in both the asylums happy by means of periodical treats, amusements and occasional gifts. The Maharajah of Kassimbazar was pleased to entertain the inmates of the Berhampur Asylum on the Peace Day with a sumptuous dinner, and Rai Bahadur Baikuntha Nath Sen also treated them to light refreshments.

Colonial Medical Reports.—No. 135.—Bengal.

TRIENNIAL REPORT ON THE WORKING OF HOSPITALS AND DISPENSARIES UNDER THE GOVERNMENT OF BENGAL, FOR THE YEARS 1917, 1918 AND 1919.

By the Honourable MAJOR-GENERAL W. H. B. ROBINSON, C.B., K.H.S., I.M.S.,

Surgeon-General with the Government of Bengal.

During the period under review the department has worked with the same strain as in the preceding triennium, for the reason that, with only a very few exceptions, the members of the Bengal Medical Service, who had been deputed to military duty, were not allowed to revert to civil employment during that period.

It is satisfactory to note that one permanent and one temporary civil assistant surgeons were granted permanent Commissions in the Indian Medical Service last year.

Improvement in the Pay and Prospects of Officers in the Medical Department.—Indian Medical Service Officers.—The pay of officers of the Indian Medical Service in civil employment has been increased with effect from December 1, 1918.

Military and Civil Assistant Surgeons.—The question of the improvement of the pay and prospects of these officers is now under the consideration of Government.

Sub-assistant Surgeons.—The pay of this class has been raised to the following rates from June 1, 1918:—

Senior grade, 1st class,	...	...	120 Rs.
,, 2nd ,,	...	...	100 ,,
Grade I over 15 years' service		...	80 ,,
Do. II from 11 to 15 years' service			70 ,,
Do. III ,, 6 to 10 ,,		...	60 ,,
Do. IV ,, 1 to 5 ,,		...	60 ,,

This has necessitated an increase in the rates of contributions payable by local bodies, &c., for the services of sub-assistant surgeons lent to them, the enhanced rates being Rs. 76 for those lent prior to August 1, 1913, and Rs. 69-8 thereafter, in place of Rs. 57 and Rs. 52 respectively.

Medical Education.—Bengal, as is well known, is in need of more qualified medical practitioners of the Licentiate or School standard. In order to meet this demand, the sanctioned strength of students in the Campbell and the Dacca Medical Schools has been increased from 350 and 250 to

500 and 400 respectively, and a Medical School at Burdwan is under construction. While there is already a Medical School at Dacca to serve Eastern Bengal, the natural claim to a new Medical School was undoubtedly that of Western Bengal, and the selection has rightly fallen upon Burdwan, which possesses a fine hospital. The new Medical School will have accommodation for 200 students. It is hoped the school will be opened next year.

In connection with the scheme for the expansion of medical education, mention may be made of the Carmichael Medical College, Belgachia, which has been recently affiliated up to the final M.B. standard of the Calcutta University. The scheme for the extension of its buildings and those of the Albert Victor Hospital attached to it, for which Government made a grant, is in progress, a third storey among other structural improvements having been added to the hospital buildings, owing to the conditions required by the university for suitable teaching facilities. When the construction of the new hospital buildings is completed, the number of beds, which is 112 at present, will be raised to 300.

The School of Tropical Medicine and Hygiene.—The School of Tropical Medicine was completed four years ago, but the institution yet remains to be opened. The delay is primarily due to the prevailing post-war conditions. Moreover, it was decided in 1917 that this school, although originally designed to teach only for the diploma in tropical medicine, should now include teaching in hygiene; consequently it became necessary to undertake the construction of additional buildings for a combined institution.

A scheme for the extension of the original building was accordingly drawn up, and the site of the police morgue was taken over for the purpose. Two building projects were sanctioned, one for the extension of the original buildings and the other for constructing a third floor over the entire building, together with the extension. The extension was commenced last year and is now nearly completed.

A scheme drawn up by the Local Government for the utilization of contributions promised by the Indian Tea, Jute and Mining Associations at Rs. 20,000 each annually for five years received the sanction of the Secretary of State, it being decided that three research scholarships shall be granted to qualified European medical officers for the investigation on practical lines of the diseases which cause sickness and mortality among the labour employed by these industries.

There is also provision for two specially endowed research posts for work on leprosy and biochemistry. In addition to this, two research scholarships will be reserved for Indian workers, and the Minto Memorial Medal will be awarded annually for distinguished work by Indians.

An endowment fund has been raised called "The Calcutta School of Tropical Medicine and Hygiene Endowments Fund" for the promotion and assistance of research work in tropical medicine and in diseases of special importance in India, the teaching of tropical medicine and the training of research workers in the said subjects. It will be administered by eleven governors vested with suitable powers and responsibilities for the proper application of its income.

The Carmichael Hospital of Tropical Diseases has been completed. It is being equipped to accommodate ninety-eight patients when opened, while eighteen more beds, making a total of 116, will be added when suitable accommodation is provided for nurses. Proposals are under consideration for providing an out-patient department, which will allow of investigation and treatment of leprosy, tropical skin diseases, &c.

Dental School.—The necessity of a dental school in Calcutta having been recognized, a scheme has been drawn up by the Principal, Medical College, Calcutta, for the establishment of a dental school in connection with that institution, and has received the approval of the Government. Administrative approval has also been accorded to the projects for building, &c.

The Serological Department.—The work of this department is steadily on the increase. To cope with the increase of work of the department the Government of India have lately sanctioned the permanent appointment of two additional assistants —one for medico-legal cases and the other for work of carrying out the diagnosis of syphilis by the Wassermann reaction.

The Recommendations of the Royal Commission on Venereal Diseases.—These were considered by my predecessor, and suggestions were duly submitted to Government as to what effective measures could be taken in this matter. It was decided by Government that steps should be taken to carry out the more urgent recommendations only, others being kept in abeyance till normal financial conditions were restored.

To improve the instruction of medical students in venereal diseases, a special department has been started at the Campbell Hospital, which it is hoped to further develop. The superintendent, in order to give effect to the recommendations of the Royal Commission, has submitted a scheme for the erection of a special out-patient department for the purpose.

Infectious Diseases Hospital for Calcutta.—This is a long-felt want. In 1917 the Local Government appointed a committee to consider the matter. The scheme has made little progress to date.

Training of Nurses.—European.—The supervision and training of the nursing staff at the Presidency General Hospital is undertaken by the sisters of the community of St. John the Baptist, of Clewer, England.

At the Medical College Hospital the nursing staff is trained and supervised by a lady superintendent, who is assisted by five senior nursing sisters, all trained in England.

On completion of three years' training, and on passing the prescribed examination, a certificate is given to each nurse.

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Indian.—The training of nurses under the Lady Carmichael nursing scheme was carried on at two centres. From the Sambhu Nath Pandit Hospital twenty-one pupil-nurses passed out successfully in the past three years under the able teaching of Miss Sherwood.

Examination and Registration of Nurses.—A scheme for standardizing the course of instruction for nurses trained at the various institutions and for introducing a uniform qualifying examination for all was under the consideration of this office last year, the scheme in force in the United Provinces being taken as a guide. The Calcutta Hospital Nurses' Institution was consulted and expressed its willingness to co-operate.

At the commencement of the year 1919 a scheme for the registration of nurses in the Bengal Presidency was inaugurated, the object of which is to raise the status and protect the interests of trained nurses and to enable employers to distinguish between the certificated and the uncertificated. The register is maintained by the Calcutta Hospital Nurses' Institution by which it will be published for the information of those interested.

Post-graduate Training.—During the last three years twenty-three medical practitioners holding charges of District Board and Municipal dispensaries in Bengal availed themselves of the opportunity, and attended the class at the Campbell Medical School.

Calcutta Hospitals and Dispensaries.

There has been one addition to the list of Calcutta institutions during the past triennium, viz., the *Sree Vishudhananda Saraswati Marwari Hospital*, a private non-aided hospital, not under Government supervision; it accommodates both in- and out-patients. This makes twenty-three institutions in Calcutta. Sixteen of these have indoor accommodation, while the remaining seven treat out-patients only, two of the former, viz., the Voluntary Venereal and the Dufferin Hospitals, are exclusively for women.

Beds.—Accommodation is now available for 2,385 patients in the above sixteen indoor hospitals. The accommodation at the Campbell Hospital is nominally fixed at 630 beds; the actual number, however, was generally much in excess, extra beds having to be provided for the large number of patients admitted during the various outbreaks of influenza, cholera and small-pox.

All our hospitals are more or less overcrowded, and yet we have to give up a considerable number of beds for incurables and permanent cripples. A convalescent home near the city is also an urgent requirement to help to relieve the pressure on our very costly hospital beds and is well deserving of consideration.

In the Dufferin Victoria Hospital the accommodation for cases of puerperal sepsis is utterly inadequate. Many abnormal cases are brought to the hospital after the indigenous *dhais* have been doing their work for two or three days. It is wrong to put such patients in the ward with clean cases even for a day. There should be a neutral observation ward for doubtful cases and another for septic cases.

Speaking of individual institutions the Campbell Hospital had an enormous admission rate in 1919. The increase is phenomenal and was influenced by the prevalence of epidemics in the town, but its popularity also brought patients readily to it. The hospital, which was formerly a "pauper and epidemic hospital" and was much dreaded, has now undergone a complete transformation by its steady expansion and the provision of improved and modern arrangements for treatment, and is highly popular among the middle and humbler classes. Lieutenant-Colonel A. Leventon, the Superintendent of the hospital, is to be congraulated for his successful efforts to meet the enormous demands on the accommodation at his disposal. On no occasion was any infectious or urgent general cases refused admission.

The existing Eden Hospital having proved to be inadequate to meet the great demands on it, an extension has become necessary. The necessary land for the extension has been acquired on which a three-storied building will be constructed, divided into European and Indian wards containing in all thirty-four beds and four cabins. The present building will also be modernized and reorganized to meet present-day requirements and up-to-date sanitary ideas. An external maternity department will soon be developed—a new departure undertaken with great hopes for the amelioration of the conditions of childbirth.

The efficiency of the Howrah General Hospital has been greatly enhanced by the provision of a gynæcological theatre, an X-ray installation, the appointment of a pathologist and an anæsthetist and the establishment of a dental clinic. Two independent practitioners are attached to the hospital as honorary dentist and honorary radiographer.

Nursing.—Three temporary cholera nurses of the Campbell Hospital were taken into the permanent establishment in 1918. This raised the number of permanent nurses of this hospital to thirty-five. Besides these, temporary nurses were employed in the plague, measles, chicken-pox and small-pox wards according to necessity. Nevertheless, the staff is admittedly disproportionate to the number of patients. It is not possible for this small staff to do more than supervise, the actual nursing being done by menial servants and students under the supervision of the resident medical officers and house surgeons.

In spite of the shortage of nurses at the Medical College hospitals, nursing has been carried on satisfactorily under the supervision of the able lady superintendent and her assistants. It is, however, time that it should be strengthened as the shortage is menacing efficiency.

Diseases.—Influenza.—The most noticeable disease of this period was influenza, which made its appearance in 1918. In 1919 deaths were fewer

in number. In 1918 the largest number of influenza patients was treated in the Campbell Hospital.

Small-pox.—The year 1917 was a non-epidemic year, and there were only twenty-eight deaths from this disease in the whole town. There was an outbreak in the following year with a mortality of 545. The past year saw a severe outbreak of this disease, causing 1,870 deaths among the general population.

Cholera.—This disease prevailed in the town throughout the triennial period. Death-rates among in-patients were 22·6, 24·5 and 28·1 per cent. respectively, a very high testimonial to the Rogers' treatment by intravenous saline, especially when one considers the very critical condition of the cases on admission.

Malaria patients were less numerous in 1918 and 1919 than in 1917.

Plague was present in the town throughout the triennium, and was more severe (especially in the last two years) than in the preceding period.

Kala-azar patients were more numerous, there having been 3,400 patients in 1917-1919, against 2,348 in 1914-1916. The good results that have attended the treatment of this disease by the use of tartar emetic and other antimonial preparations undoubtedly attracted patients to the Calcutta hospitals in larger numbers. Most of the patients had the advantage of being treated by Lieutenant-Colonel Sir Leonard Rogers and Rai Upendra Nath Brahamachari Bahadur, M.D., our experts in kala-azar treatment.

Tubercle of the Lung.—The attendance of patients suffering from this disease was less. The death-rate was also much lower last year. The death-rates were 56·5, 74·2 and 56·9 respectively.

Venereal Diseases.—In the past year an experimental dispensary, presided over by Mr. K. K. Chatarji, F.R.C.S., was opened every Saturday afternoon at the Campbell Hospital, and is largely attended and doing high-class work.

Diabetes.—Lieutenant-Colonel Waters continued his work in the treatment of diabetes with great success. Major D. McCay, engaged in inquiring into the causes of the prevalence of diabetes in India since 1915, completed his inquiry and submitted his report.

Surgical Operations.—The progress of surgical work of the Calcutta hospitals was impeded to a certain extent in 1918 owing to the outbreak of epidemic influenza. The death-rate among in-patients operated on was 3·6 in 1917, 4·06 in 1918, and 3·7 in 1919; this is an admirable record, as many of the operations were of a highly serious nature.

Among selected operations, extraction of lens for cataract formed the largest number, i.e., 3,811. There were 1,938 abdominal sections (other than obstetrical). Vesical calculi were removed in eighty-three cases. 843 operations on hernia were performed; of these 569 were done for radical cure and the remainder for strangulation. There were 544 operations for excision of elephantoid scrotum, 1,483 operations on bones, and 549 amputations.

Lady Minto Electrical Annexe, Medical College Hospitals.—This institution continues to give great facilities in the diagnosis of medical and surgical cases. The X-ray work has been well maintained, in spite of great difficulties in obtaining supplies from Europe during the war. A Snook X-ray apparatus capable of doing the heaviest work was obtained in May, 1919; this machine has been purchased by Government, and is giving first-class results. In addition the department now possesses two Coolidge X-ray tubes, which are specially adapted for therapeutic work.

Major J. A. Shorten, I.M.S., was appointed Honorary Radiologist, and is now in sole charge of the electrical annexe. The staff of the department is being reorganized under his supervision.

District Hospitals and Dispensaries.

The triennium opened with 700 institutions. The number of dispensaries at the end of the period was 765. In order to bring all villages within easy reach of a dispensary, as urged by the District Boards, it would be necessary to establish 287 more dispensaries.

The number of dispensaries actually opened is sixty-eight. It is hoped that it will be possible to open without much delay the State-public dispensary at Mainamukh in the Chittagong Hill Tracts, for which sanction of Government was obtained last year.

Each year finds a number of temporary dispensaries in operation for short periods in different districts, either in connection with fairs or to render medical aid in places affected by malaria and other epidemic diseases. The system of subsidizing private medical practitioners with a view to induce them to open dispensaries at places where there is no medical aid available was also followed in certain districts.

All the permanent dispensaries, except those in Class VI, are periodically inspected by the civil surgeons, those at headquarters being visited daily.

In November, 1917, Miss Wickham, L.R.C.P. & S.Edin. of W.M.S., was deputed to Bengal by the Central Committee of the Countess of Dufferin Fund to inspect Dufferin Fund aided hospitals in the capacity of Assistant to the Surgeon-General. She found the majority of these hospitals to be cheerless and comfortless institutions, very much exposed, and therefore unlikely to attract the class of women for whom they were designed. Attempts are being made to remedy the defects noticed, but the lack of funds is the chief difficulty.

Patients treated.—Altogether 20,179,197 sick persons received medical aid in areas outside Calcutta during the past three years. The large increase in the number of patients treated is attributable partly to the unhealthiness of the last two years of the triennium caused by the outbreak of influenza, cholera and small-pox, and a more widespread prevalence of malaria, and partly to the addition of seventy-seven new dispensaries. It is also due to the increased confidence of the people in the European system of treatment and of the growing popularity of the medical institutions.

The increase is even more marked in the outdoor department than in the indoor.

In-patients.—Patients treated in the indoor wards of hospitals of all classes numbered 208,860, as compared with a total of 184,205 intern patients treated in the previous three years. There was a progressive increase of indoor work of eleven institutions, while the work of three steadily declined.

I have nothing new to say with regard to the nursing arrangements in mufassal institutions. This important part of the medical treatment is still left to the relatives of patients or to the hospital dressers, compounders and ward coolies. Want of money is the chief obstacle in the way of introducing suitable provision. At Mymensingh steps have been taken to appoint a staff of trained Indian nurses headed by a European lady as soon as suitable quarters are ready.

Diseases.

As usual the largest number of patients treated was for systemic diseases. Diseases of infectious origin gave the next large number. The most common among systemic diseases were dyspepsia and affections of the eye.

Malaria among infective diseases presented the largest number. In fact this has been the most commonly treated disease, and presented more than a third of the total number of patients attending dispensaries. Treatment by injections of quinine salts was more largely resorted to with satisfactory results. Owing to the high price of quinine and the chronic poverty of mufassal hospitals and dispensaries, it was not possible to treat malaria patients with effective doses of quinine as recommended by the Provincial Malaria Committee. Patients' reluctance to continue treatment, once the fever is stopped, also stood in the way.

Influenza.—Almost all districts were visited by this disease in a severe epidemic form in the middle of 1918. As far as could be ascertained 134,057 influenza patients were treated in 1918 and 56,687 in the first few months of the past year. The very large record of pneumonia patients during these two years leads to the belief that influenza patients who developed pneumonia were returned under this head instead of the primary disease.

There was a severe outbreak of cholera in several districts in 1918 and 1919. The death-rates among in-patients in the last two years were 14·16 and 25·40 per cent.

The severe outbreak of small-pox last year in several districts caused a large increase in the number of small-pox patients in that year.

Venereal Diseases.—These are at present recorded under two heads, viz., gonorrhœa and syphilis. The total number of patients treated for gonorrhœa and syphilis put together amounted to 64,219 in 1919. Only 480 patients were treated with salvarsan or its substitutes last year. It was not possible to adopt this treatment generally owing to the prohibitive price of the drug.

Tubercle of the Lung.—There was very little variation in the number of phthisis patients treated in 1918 and 1919. The special tuberculosis wards provided in almost all the sadar hospitals so far have not become popular.

Leprosy.—This disease is treated chiefly in the three leper asylums. The first is maintained by Government, while the other two are under the Mission to Lepers, helped by Government subventions.

Lieutenant-Colonel Sir Leonard Rogers carried on his research on leprosy and on its treatment. The drugs tested were the sodium hydnocarpate from chaulmoogra oil recently supplemented by sodium soyate from the expressed oil of soya beans. He was ably assisted in the preparation and chemical study of these compounds by Dr. Sudhamoy Ghosh and on the therapeutic side by Assistant Surgeon Jogesh Chandra Mukharji. The results obtained were highly encouraging in early cases.

Dr. K. K. Chatarji, Teacher of Surgery, Campbell Medical School, is at present engaged in experiments on margosic acid (*nim*) as a cure for leprosy, and has been encouraged in his work by financial aid from the Indian Research Association Fund.

The question of amending the Leper Act so as to widen the definition of a statutory leper and of establishing leper colonies is now engaging the attention of Government. A scheme was drawn up in consultation with the Secretary for the Mission to Lepers for establishing a colony for lepers which has been submitted to Government this year, and is now being gone into and the acquisition of a suitable site is being considered.

Surgical Operations.

The surgical work of mufassal institutions records a falling off as compared with the preceding triennium. The fall is chiefly due to the fact that simple procedures as the extraction of loose teeth have been excluded from the operation statement. The outbreak of influenza epidemic also interfered with the surgical work.

General Remarks.—My best thanks are due to the Indian Medical Service officers, who have uncomplainingly borne the strain and pressure of the past three years, practically all long overdue for furlough and many carrying on double duties. The heavy strain they have so willingly withstood has, I regret to say, entailed the death of two and the serious breakdown of several others.

As regards the military assistant surgeons, the few who could be spared during the war were mostly time-expired men, who carried out their onerous duties most admirably, and to them my fullest thanks are due. Recently some men of this class have reverted to civil duties, but with the wretched rates of pay, fixed a generation ago, it is impossible for them to long remain in civil employment, where their conditions are worse than in the military side. It has long been understood that their pay was being reconsidered; the delays, however, are disheartening, and it is impossible to expect men to give whole-hearted and contented service under the prevailing conditions of their

service. As a class they fill difficult and troublesome appointments, willingly and loyally, with, I fear, scant reward or consideration.

The civil assistant surgeons have done excellent work all round, many have had unique opportunities of showing their worth as officiating civil surgeons, and have given satisfaction in most respects.

The sub-assistant surgeons have had a considerable increase to their pay; they well deserved it, as they are one of the most useful and hard-working branches of the Medical Department. They are now a very well-trained body who have made rapid strides within the past few years; a few have been advanced to the Provincial Medical Service after twenty years' service, and any scheme that will enable really gifted men of this branch to reach higher appointments deserves every possible consideration. Should this be possible one of their main grievances would be removed.

I wish to thank my office staff for all their ready and willing work since I joined the Presidency; one and all they have rendered me most loyal and ungrudging assistance at all times; the Head Assistant, Babu Sarat Chandra Roy, and the next two senior assistants, Maulvi Abdur Rahman and Babu Prafulla Kumar Mallik, have managed their branches most effectively. To my friend, Rai Sahib Mohendra Nath Bhattacharji, I.S.O., my warmest thanks are due for the admirable way he has carried out all his duties as my personal assistant.

Campbell Hospital.

Note on the Small-pox Epidemic.

For some unexplained reason, small-pox has afflicted Calcutta in epidemic form every fifth year. Some of our epidemiologists might study this phenomenon and explain its quinquennial incidence. A possible explanation might be that immunity conferred by vaccination lasts only four to five years, and the protection afforded by re-vaccinations, which during an epidemic are very freely carried out, peters out, leaving people susceptible that were protected three to four years ago; a number of children born during that lustrum will not be vaccinated, and here we have a medium in which the virulence of an infection may be exalted. Why vaccination should be looked upon with disfavour in non-epidemic years is inexplicable. I suppose it has something to do with the old adage —"When the de'il was well, the de'il a saint was he," and the importance of periodical re-vaccination hardly ever comes into discussion except when there is an epidemic threatening or actually prevailing. It will take a deadly outbreak of small-pox to convince some families of the absolute necessity of vaccination and re-vaccination. The pity of it is that innocent children, who have no power to protect themselves, are exposed to torture, disfigurement and death by the slackness or perversity of their natural guardians. Re-vaccination is not compulsory by law, but vaccination is, in certain areas. In epidemic times it becomes manifest how often the law is evaded and the excuses therefor, which would be considered silly and petulant were they not so pitiful; very often I have rated parents about their infants and children being left unprotected, and have been sorry afterwards, for the sight of their suffering offspring (and death even) has been sufficient punishment for their perversity.

Another cause contributing to a periodical outbreak is the sketchy and faulty way in which the very simple operation of vaccination is carried out. I have seen cases where vaccination has failed, for the operator took such antiseptic precautions that he actually sterilized his lymph. A tube of lymph may be faulty or sterile; and in many cases insufficient insertions are made; all these factors contribute to faulty vaccination, and the pitiable story of "the child was vaccinated but did not take" is too frequent to be neglected.

The question therefore arises of the necessity of a thorough and sound vaccination campaign during the intermediate years; moral suasion unless accompanied by a certain amount of penalty is of very little avail, and unless re-vaccination is carried out as a general practice every four to five years, we may always expect to have a quinquennial epidemic. Recently a Japanese professor of medicine visited our hospital to see small-pox. He had not seen any case in his own country, for vaccination and re-vaccination are compulsory there. A feature of this outbreak is that quite a number of Europeans very recently arrived in Calcutta contracted the disease; they had not been protected since childhood, and some had only doubtful marks; a good and sound practice would be to direct or advise all new-comers to be re-vaccinated immediately on their arrival. You cannot get away from small-pox infection here. I have (personally) seen cases in trams, a post office crowd around the money-order window, and in the street, and patients come to hospital in taxis and ticca gharries which try to evade cleansing and disinfection. This was a marked feature last year, and I felt it necessary to report same. A police order was issued, and I gave orders to my tindal that he was to be careful not to injure the gear or fittings, and I am glad to report that hackney people and taxis now do not object to their vehicles being cleansed and disinfected. Crowds of passengers and railway trains are notable foci.

It is often not possible to trace cases; the giving of false names and addresses is not uncommon.

Under the law as it exists at present, coming to hospital is voluntary. I do not believe a tithe of the number affected come to hospital; very many cases are treated at their homes (or rather left untreated). The roof of the house is the favourite place; a short while ago we had thirty-two admissions on one day; it was a day of great storm and rain, and I concluded they were washed off their roof-retreats. The vast majority of cases coming to hospital are severe cases; mild, discrete and modified cases, which ought to form the bulk of an epidemic, are usually kept at home.

Colonial Medical Reports.—No. 135.—Bengal (*continued*).

During 1918 only 107 cases of small-pox were treated at the Campbell; of these fifty-one were cured, fifty died, and six absconded from hospital. During the November of that year we actually had a short period of not a case of small-pox in the house. 1919 was a bad year; it bore such a resemblance to the pre-epidemic year 1914 that we took it for granted that a severe outbreak was pending. At my instance, early in the year, the health officer issued warning notices, and made vaccination free in all the vaccination stations. Cases became more frequent; we were never without from a dozen to fifty or sixty cases in the house during the whole year; wherever possible vaccination was advocated, but in December the disease declared itself in true epidemic form. I addressed every doctor I knew, and I believe that a vigorous vaccination campaign resulted. A total of 810 admissions were recorded in 1919, of which 444 recovered, 321 died, and 45 absconded from hospital. But 1920 (till March 28) has been a terrible time; 1,002 admissions and 350 deaths have been recorded (seven absconded) (at the time of writing there are about 150 under treatment).

Our accommodation was soon taxed to its utmost; in December, 1919, we recorded 115 admissions; January, 1920, 342; February, 395; and till March 28, 365. Our holding capacity is nominally 164, but by rearrangement and taking up the plague ward we could house about 200. I turned the European non-paying ward into an Indian ward and concentrated all Europeans and Anglo-Indians in the European paying block; this was to obtain more room for Indians and to facilitate nursing. Occasionally Indians were housed in the European paying block. It was soon seen that accommodation would be insufficient, so I suggested to Dr. Crake that a large shed roofed with corrugated iron be built on the small-pox compound lawn. This was done very rapidly, and a fine long house with sal posts, brick floor covered with 1 in. asphaltum and mat walls, and a wash-house and latrine (pucca). This held forty beds and was used for convalescent cases; it was cold at night, but that was met by issuing an extra ration of blankets. There was great competition in getting a "seat" in this ward. This increased our capacity to 240. Even this was insufficient. I therefore suggested to Dr. Crake to search out a "garden house" with a big compound not too far off, to which convalescent cases could be sent, i.e., those requiring no nursing and waiting only for their scabs to fall. I proposed to keep all "acute" cases at the Campbell, and relieve the congestion by transferring convalescents to the "garden house," thus establishing a convalescent and segregation home at a very small upkeep cost; Dr. Crake agreed with me, and expressed the opinion that this convalescent home would be far preferable to opening another hospital elsewhere which, with its attendant cost for medical, nursing and menial staffs, would be far more expensive and less efficient. He engaged No. 37, Tangra Road, Entally, and built sheds to house convalescents. Our first batch of twenty went there on February 1, 1920, and since then a steady flow of convalescents were carried by the ambulances, and we were able to carry on without opening accessory hospitals elsewhere. The total accommodation available in the Tangra home was approximately 100. This was not the only emergency accommodation available, for Dr. Crake has still the Surinam depot to fall back on. I do not think it will be required, except something very unforeseen occurs. I should here state that only male convalescents were transferred to the Tangra home.

Equipment.—It is a difficult matter to equip a place at a moderate cost in a hurry, but here we were very fortunate. The Superintendent, Presidency Jail, manufactured and supplied 130 beds at very short notice. The Red Cross were dismantling their furlough (G. and S.) home, and the Lady Superintendent, Mrs. Cottle, C.B.E., very kindly gave me practically first choice of their large stock, and I was able to purchase, from our Small-pox Relief Fund, a large supply of clothing, bedding, bed linen, items of furniture, &c., at very much reduced rates. I was therefore enabled to get my forty-bed ward ready for occupation before the builders were out, and it was full the next day and relieved the overcrowding in the male wards.

In the matter of accommodation I have only to state that no case of small-pox was refused admission. I have no doubt that there were several thousands of cases in the city, but as I previously remarked, only bad cases came to hospital and people of the fluctuating population.

Nursing presented a great problem; small-pox is a disease which during certain stages requires nursing offices and attendance of the most exacting nature; the wretched patients simply cannot help themselves or even feed themselves at all. I got as many nurses as I could under the scale permitted, and even overstepped the scale at times. Indian nurses' services were freely engaged. We have been most remarkably free from the dreadful ophthalmic "accidents" which happen in a small-pox epidemic. Early in the epidemic I told off a nurse who was specially instructed and attended only to "eyes"; she had no other work, and I have no doubt saved many eyes. I also told off four intelligent coolies to act as "oilers"; these went from bed to bed, anointing the patients with our small-pox body oil, not only a healing but a most soothing unction. In the corrugated iron house, a sort of commune obtained where convalescents anointed each other. This oil, which has Ol. arachis (groundnut oil) for its basis, was issued very freely. I was enabled (from my Small-pox Relief Fund) to issue 4 and even 6 oz. daily to each patient, hence our expenditure in this item was immense, often as much as 60 lb. a day.

Servants were difficult to get; at one time a "strike" threatened, but a judicious inquiry soon removed the cause of discontent. I need hardly

say that it means a slight rise in wages. I called it staff-pay, and here again the Small-pox Relief Fund supplied the needful. I am quite satisfied that the service rendered by these humble folk was good. They were not afraid of even the most loathsome patient.

Baths form a very important part of small-pox treatment; in fact, I consider it almost the most important. Hitherto we had to depend on the dirty, wasteful and laborious "salamander." I got a couple of geysers, one I installed in the European block and the other in the long Indian ward, and now streams of hot water are being delivered all day long. I paid for these geysers from my Small-pox Relief Fund, and the Manager, Oriental Gas Company, very generously gave me them at a very reduced price, and Messrs. Incell and Silk fitted the gas and water attachments.

With the enormous population in the small-pox compound a shortage of filtered water soon manifested itself; and pumping our tanks full was not possible, as our reservoir could not be fed sufficiently. This was met by drawing in another ferrule from the Beliaghata side.

I have several times referred to the "Small-pox Relief Fund" as being the treasury on which I drew. Early this year I circularized the great firms in Calcutta and met with a most generous response. From this fund we purchased comforts, extra requisites, fruit, and clothing, and we paid extra remuneration to servants for extra work and for additional nursing during a big rush.

Clothing is a serious item; patients come in with a few rags, soiled and infected. These have to be destroyed, and such people were given a new outfit when leaving hospital. Such clothes as were fit to be saved were washed, sterilized and returned to patients.

Disposal of the dead presented no difficulty, every caste being dealt with according to the custom thereof. The Anjuman Mufid-ul-Islam deserve great praise.

Throughout the epidemic we have afforded facilities for relatives to visit patients, the only stipulations being recent vaccination, wearing of gowns and caps (of which a large number were provided) and ablutions previous to departure. I do not think infection was conveyed out of the hospital. I am of opinion this concession brought many more patients to hospital and redeemed it of its pest-house name. Friends and relatives were assured by personal observation of the care and attention paid to the sick, and the precautions observed were great lessons, the particular object of which was the immunity conferred by proper and successful vaccination.

Medical officers were selected from the supernumerary staff of the Campbell and were most careful in their ministrations. I have to express my best thanks to the chairman and Dr. Crake for their cordial co-operation. We have put this epidemic through without a hitch of any kind; the generous donation of the Corporation of Rs. 5,000 to the Small-pox Relief Fund was so prompt and timely that it enabled me to start my comforts, equipments and many extras very early in the epidemic. The prompt setting up of the Tangra convalescent home relieved the hospital immensely.

I should not have been able to carry on at all without Rai Bahadur Dr. L. B. Ganguly and my Deputy Superintendents. I cannot say enough of their work and their conscientious disregard of self.

A. Leventon, Lt.-Col., I.M.S.,
Superintendent, Campbell Medical School and Hospital.

Calcutta,
March 28, 1920.

Government of Bengal.

Calcutta,
December 7, 1920.

The medical Department had to work under the same adverse conditions as in the preceding three years for the reason that the medical officers, who had been deputed from Bengal to military service, were not allowed to revert. This serious and continuous drain upon the resources of the province has meant that work has been carried on in most unfavourable circumstances, and even to carry on has imposed a heavy strain on all concerned.

Medical Education.—The need for a greater number of qualified medical practitioners has received the earnest attention of Government. In order to meet this demand, the sanctioned strength of the students at the existing Government Medical Schools at Calcutta and Dacca has been raised to 500 and 400 respectively, while the establishment of a new medical school at Burdwan has been sanctioned. It is hoped that it will be opened next year. The Carmichael Medical College at Belgachia has now succeeded in obtaining affiliation up to the final M.B. examination of the Calcutta University.

The School of Tropical Medicine at Calcutta was completed four years ago, but could not be opened on account of conditions arising out of the war, and this has been among the most unfortunate results of the dislocation of the Department. In 1917 it was decided that the school, which was originally designed to teach only for the diploma in tropical medicine, should be combined with a new Institute of Hygiene, thus rendering necessary the construction of additional buildings. Revised proposals for the increased staff and for an extended syllabus required for the combined institution are now under the consideration of the Government of India, and it is hoped that there will be little further delay in opening the school and the Carmichael Hospital for Tropical Diseases attached to it. Research work will also be started shortly in connection with the school out of the funds generously contributed by the Indian Tea, Jute

and Mining Associations and certain private firms and gentlemen.

A scheme has also been drawn up for the establishment of a Dental School to be attached to the Calcutta Medical School.

The arrangements introduced in 1912 for holding post-graduate courses in the Government medical schools for the benefit of private doctors working in local fund dispensaries continued, and during the last three years twenty-three medical practitioners employed in District Board and Municipal dispensaries attended the class opened for them at the Campbell Medical School.

The work of the Serological Department at the Calcutta Medical College is steadily increasing, and the Government of India have lately sanctioned the appointment of two additional assistants.

Calcutta Hospitals.—The establishment of a separate hospital for incurables in Calcutta has become a matter of urgent necessity. The want of a convalescent home near the city to relieve the pressure on the medical college and other hospitals has also been brought to notice. Another long-felt need is the provision of a suitable infectious diseases hospital. In 1917 a committee of six members was appointed by Government to consider the matter and to select a site outside municipal limits. After much delay, the committee came to the conclusion that two hospitals for the treatment of infectious diseases are required in Calcutta, one for the northern and the other for the southern part of the city.

The scheme of having honorary medical officers on the staffs of the Sambhunath Pandit and Mayo Hospitals continues to prove satisfactory. The system of appointing medical men outside the ranks of Government service to the house appointments of the Medical College Hospitals has not, however, proved a success.

The total number of indoor patients treated at the Calcutta hospitals increased during the triennium, and the outdoor patients' attendance exceeded the figures for the previous triennium by 135,511. The provision of proper nursing is absolutely essential to efficiency, and failing greater public support the hospitals cannot but be severely handicapped.

Leprosy.—This disease is treated chiefly in three leper asylums. The first is maintained by Government, while the other two are under the Mission to Lepers, helped by Government.

The Lepers Act has been amended so as to widen the definition of a statutory leper. The arrangements at present existing in the leper asylums are not up to date, while the accommodation provided therein is also insufficient. A more satisfactory way of dealing with the problem is to open large leper colonies or settlements, and the question of establishing a leper colony is engaging the attention of Government. The difficulty will be mainly financial.

A. MARR,

Secretary to the Government of Bengal.

Colonial Medical Reports.—No. 135.—St. Vincent.

REPORT OF THE COLONIAL HOSPITAL, ST. VINCENT, APRIL 1 TO DECEMBER 31, 1919.

By CYRIL H. DURRANT, M.B.,

Colonial Surgeon.

COLONIAL HOSPITAL, ST. VINCENT.

April, 1920.

THE Registrar-General's returns showed that the estimated population of the Colony at December 31, 1919, was 53,210. The total number of births was 1,320. The birth-rate was 24·8 per thousand. The total number of deaths was 706. The death-rate was 13·26 per thousand.

Remarks on Particular Diseases.—Malaria has been less prevalent than in the two preceding years, 273 cases with eleven deaths being recorded in the nine months as against 352 cases with seven deaths and 512 cases with six deaths in the two previous years.

The district medical officers all draw attention to the prevalence of yaws, infantile diarrhœa and syphilis.

Tuberculosis claims its steady toll of victims each year, 124 cases with twenty-seven deaths being recorded in the nine months' period.

Yaws Prevention.—During the period April 1 to December 31, 1919, 287 new cases were treated and 200 were discharged cured, leaving 320 under treatment.

The following report on the working of the dispensary system since its commencement on April 1, 1916, is submitted:—

During the year April 1, 1916, to March 31, 1917, the following results were obtained:—

Total cases treated, 1,718; total cases discharged cured, 689; total cases still under treatment, 687; not accounted for, 486.

During the year April 1, 1917, to March 31, 1918, the results were as follows:—

Five hundred and ninety new cases were treated and 463 were discharged cured.

At the end of these two years the results showed:—

Total cases treated from April 1, 1916, to March 31, 1918, 2,308; total cases discharged cured, April 1, 1916, to March 31, 1918, 1,152; total cases still under treatment, April 1, 1916, to March 31, 1918, 619; not accounted for, 537.

During the year, April 1, 1918, to March 31, 1919, 380 new cases were treated and 299 were discharged cured.

At the end of three years the results showed:—

During the year, April 1, 1918, to March 31, 1919, 2,688; total cases discharged cured, April 1, 1916, to March 31, 1919, 1,451; total cases still under treatment, April 1, 1916, to March 31, 1919, 324; total cases not accounted for, 913.

During the period, April 1, to December 31, 1919, 287 new cases were treated and 200 were discharged cured.

At the end of this period the results obtained are as follows:—

Total cases treated from April 1, 1916, to December 31, 1919, 2,975; total cases discharged cured, 1,651; total cases still under treatment, 320; total cases not accounted for, 1,004.

These figures illustrate two particular points, viz., the fall in the number of new cases attending each year and the rise in the numbers of "those unaccounted for." In the latter case there is possibly a large margin of error in that some of those "unaccounted for" may have subsequently returned for treatment or may have sufficiently recovered to return to work, but in the former case the excuse cannot be made that the disease has been so reduced to account for the diminution in the numbers attending for treatment, and the obvious remedy lies in compulsory attendance of those infected with the disease for treatment.

District Nursing (Child Welfare).—The system of district visiting by a qualified nurse-midwife which had been hitherto confined to the No. 2 District was extended to Kingstown and the surrounding district, and to Georgetown and the surrounding district during the period under review.

Report of the Kingstown District, April 1 to December 31, 1919.

The population of the district comprising the town of Kingstown and the adjacent village of Edinboro is estimated at 5,000.

There were 142 births and eighty-five deaths, giving a birth-rate of 28·4 per thousand and a death-rate of 17·0 per thousand.

There were eighteen stillbirths.

Mortality was relatively higher in the July-September quarter, when eighteen deaths in 775 cases were recorded, as against thirteen deaths in 801 cases in the April-June quarter.

Of notifiable diseases recorded there were three cases of chicken-pox, eight cases of measles, fifteen cases of yaws, and twenty-six cases of pulmonary tubercle with four deaths.

Among other diseases there were 164 cases of catarrhal fevers with six deaths, fifty-eight cases of infantile diarrhœa with twelve deaths, and sixty-three cases of syphilis (later manifestations) with four deaths. Thirty-one cases of malaria with one death were recorded as against eight cases with no deaths in the previous year.

The sanitary condition of the town of Kingstown has been fairly well maintained.

Vaccination has been regularly carried out during the period under review.

One hundred and twenty-five primary vaccinations were performed.

Cyril H. Durrant, M.B.

Report of No. 1 District.

The Beeches,
Kingstown.

Catarrhal fevers were more frequent in the second and third quarters, and also diarrhœa in children. In the month of June malarial fevers were the highest, 100 per cent. more than any other month, with the exception of May, which month was 30 per cent. lower than the month of June.

Four deaths in nine cases of phthisis shows that those in the last stages of this disease came to see what the new man may be able to do for them.

General Sanitary Conditions of the District.

A new system was adopted at the end of the year; a sanitary inspector was assigned to each medical district, to work immediately under the control of the district medical officer. This is a move in the right direction. In regard to the inspector appointed to the No. 1 District, I make him keep a daily diary of the work done, so that besides his monthly report that he inspected so many premises, which I would not be able in any way to check, I have the daily report, specifying what part of the district he visited, and how many houses he inspected in that district. I am thus in a position to see whether my inspector is doing his work or not. A most important part of the sanitary inspector's work is mosquito inspection, the old idea that it is mosquito season, and therefore we must have mosquitoes, must be broken down. The so-called mosquito season is in the dry weather when the numerous small running streams passing through the town and its vicinity partially dry up, leaving many small pools, which soon become crowded with larvæ; clearing a small channel from one pool to the other will soon dry these pools, and I hope next year to give this a fair trial.

There were 156 vaccinations, but a large number of these never returned to verify that the vaccination had taken. From the fact that when the first vaccination failed to take, the mother brought the child back to be re-vaccinated, it can be assumed that those who did not return to verify the vaccination were successfully vaccinated.

E. Greaves, M.B., C.M.

Colonial Medical Reports.—No. 136.—St. Vincent *(contd.)*.

REPORT OF No. 2 DISTRICT (NORTH).

CHATEAUBELAIR,
May, 1920.

Estimated population, 4,000; births, 85; deaths, 45; stillbirths, 4, giving a birth-rate of 21·25 per thousand, and a death-rate of 11·25 per thousand.

Of notifiable diseases, there were measles one case, and yaws six cases.

Of other diseases, ankylostomiasis four cases, catarrhal fevers fifty-two cases, with three deaths, diarrhœa in adults twelve cases, diarrhœa in children forty-six cases with seven deaths, more than half the number of cases seen occurring in August and September. There were six cases of dysentery with one death, filaria one case, malarial fevers nineteen cases with one death, the majority of these cases being seen in Spring Village.

Only two cases of malignant growths were seen, and four of pulmonary tuberculosis.

Of syphilis there were nineteen cases with two deaths, and of the other cases seen, not enumerated above, no fewer than 202 were treated for intestinal parasites.

ALLAN W. LEWIS.

REPORT OF No. 2 DISTRICT (SOUTH).

CANE GROVE,
March 20, 1920.

Estimated population, 6,500; births, 170; deaths, 88; stillbirths, 5; giving a birth-rate of 26·1 per thousand and a death-rate 13·4 per thousand.

Diarrhœa in children, 112 cases recorded with seven deaths.

Intestinal Parasites.—Very prevalent in entire district and responsible for a too large death-rate amongst young children.

Yaws.—Although very prevalent in district, few attend for treatment, parents refusing to allow their children to come and have treatment at dispensary.

Venereal Disease.—Accounts for a large amount of suffering.

Catarrhal Fevers.—150 cases with twelve deaths.

Malaria.—Ninety-four cases with four deaths.

Skin Infection.—Is very prevalent, scabies being very common, followed by impetigo.

On the whole the sanitary condition of district is fairly good, and a noticeable change for the better can be found since the appointment of a sanitary inspector for district.

Sixty vaccinations were successfully performed.

Yaws is extraordinarily prevalent in the district; it is very remarkable how few suffering from it come for treatment.

The attendance of children for vaccination is not as regular as it should be. The parents apparently take advantage of the fact that no return of successful vaccinations is sent to out-stations.

D. S. GRAHAM.

REPORT OF No. 3 DISTRICT.

BELAIR,
June, 1920.

Estimated population, 10,870; births, 295; stillbirths, *nil;* deaths, 113.

Sickness was most prevalent in May, July and September, May being the worst month.

REMARKS ON PARTICULAR DISEASES OCCURRING DURING THE YEAR.

Leprosy.—One case was recorded, which proved fatal.

Catarrhal Fevers.—233 cases were recorded with thirteen deaths.

Malaria.—This was not so prevalent, eighteen cases being recorded with no deaths.

Diarrhœa.—Was prevalent throughout the year, 192 cases being recorded with six deaths.

Dysentery.—Forty-eight cases were recorded with two deaths.

Pulmonary Tuberculosis.—Twenty-one cases were recorded with eight deaths.

Syphilis.—Thirty-five cases were recorded with five deaths.

Yaws.—Fifty-five new cases were recorded during the year with no fatality.

The general sanitary condition of the district was satisfactory. A sanitary inspector was attached to the district in October.

The total number of vaccinations for the nine months under report was 196. The supply of lymph was very erratic, and in some occasions was too old and of no use.

The appointment of a sanitary inspector was a step in the right direction, and helps materially towards raising the sanitary condition of the district. Mr. Falby gave satisfaction for the short period he worked in the district under review.

Yaws work is still very disappointing. It would be a great help if the Yaws Hospital could be enlarged materially, so as to accommodate about 200 cases, so that all cases could be sent there for *specific* treatment and segregation.

Numbers of villagers need a definite and wholesome water supply. The average individual thinks it too much trouble to boil his water. Infantile diseases still hold a high percentage, but I think parents are learning to appreciate the value of early help and advice more than they used to.

W. A. GEORGE.

REPORT OF No. 4 DISTRICT.

THE CEDARS,
April, 1920.

Number of living births, 203; number of stillbirths, ten; number of deaths, ninety-one.

Sickness may be said to have been most prevalent during the first quarter. There was a mild epidemic of measles, and children's diarrhœa was most prevalent during this period.

Return of Diseases and Deaths in 1919 in the Colonial Hospital.

St. Vincent.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	—	—	—
Anæmia	—	—	—
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	1	—	1
Dysentery	5	1	5
Enteric Fever	4	2	4
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	20	—	21
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	5	—	8
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	46	5	47
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—			
Non-malignant	2	—	2
Malignant	3	—	3
Old Age	15	4	16
Other Diseases	41	2	44
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	10	—	10
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	3	—	3
(*b*) Secondary	—	—	—
(*c*) Tertiary	35	1	38
(*d*) Congenital	—	—	—
Tetanus	3	2	4
Trypanosoma Fever	—	—	—
Tubercle—	6	—	8
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

General Diseases—*continued.*	Admissions	Deaths	Total Cases Treated
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	—	—	—
Yaws	2	—	4
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	73	2	80
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	5	2	5
(*b*) Other Diseases	3	—	4
Digestive System—	—	—	—
(*a*) Diarrhœa	1	—	1
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	7	1	7
Ear	—	—	—
Eye	21	—	24
Generative System—	—	—	—
Male Organs	34	—	40
Female Organs	136	4	142
Lymphatic System	—	—	—
Mental Diseases	—	—	—
Nervous System	11	—	12
Nose	13	—	13
Organs of Locomotion	13	—	13
Respiratory System	29	4	35
Skin—	43	—	73
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	29	5	32
Injuries, General, Local—	65	3	71
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	7	—	9
Ascaris lumbricoides	13	1	14
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	46	3	47
Filaria medinensis (Guinea worm)	3	—	4
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Infantile diarrhœa furnishes the largest number of cases. Yaws continues to be prevalent; forty-five new cases were admitted to the dispensaries and forty-nine persons were discharged. Some cases of measles were seen, and there were many more that did not apply for medical treatment. Thirty-three cases of influenza are recorded for the period. There were nine cases of malaria.

The general sanitary condition was fair. The house to house inspections in the different villages by the newly appointed sanitary inspector have undoubtedly had the effect of improving their condition.

The number of successful vaccinations was 113. The lymph was supplied irregularly.

D. A. Greaves.

Report of No. 5 District.

Casualty Hospital,
Georgetown,
May 10, 1920.

Live births, 134; deaths, fifty-nine; stillbirths, five; natural increase, seventy-five.

The outstanding feature is that we have had very little epidemic disease. Only twenty-five cases of measles were treated, and of these nineteen cases occured in April. Two cases of enteric fever are recorded, one in May and one in July.

Of other diseases, catarrhal fevers showed a marked increase during the last two quarters of the year, and diarrhœa amongst children was most prevalent from April to October with a marked drop in November and December.

The increase in deaths in July is due to the diarrhœas of children, which claimed six out of twelve fatal cases for that month.

During the dry months cases of catarrhal fevers were few; but these troubles became prevalent in the rainy months. Dysentery also increased during the rainy season.

Of notifiable diseases there occurred two cases of enteric fever with one death, twenty-five cases of measles with one death, and forty-one cases of yaws.

Catarrhal Fevers.—156 cases were recorded, and of these three died.

Diarrhœa in Children.—As usual a large number of children was affected—138, and what is more serious, diarrhœa caused nearly one half the number of deaths for the nine months under review.

Gonorrhœa has become one of the commonest of complaints. Moreover, it is mostly the complicated cases one is called upon to treat. The ignorance as to its causation and infectivity is appalling, hence there is no barrier to the spread of it.

Yaws.—An analysis of cases on the register at the Georgetown Dispensary shows that twenty-eight cases underwent treatment during the nine months, none of which were recorded as cured. The fifteen written off had received no treatment during the period under report, but had been traced at different times and found free from manifestations of the disease. The earliest date at which any of the above fifteen had abandoned treatment was September, 1916, and the latest, November, 1918. The average length of time under treatment was twenty-two days. These facts in conjunction with my unrecorded experience of dispensary treatment shows:—

(1) That the vast majority of patients abandon treatment.

(2) An average period of three weeks is the longest time patients will hold on in hope of relief.

(3) That patients are not visibly affected by this treatment in this time; indeed, in a large number the disease persists from one to three years.

(4) That the treatment with the iodides of mercury and arsenic and liquor hydrarg. perchloride is valueless.

(5) That those treated as cured owe the disappearance of the skin lesions to Nature.

Furthermore, it is very evident that the disease is greatly on the increase and unfits many children for school and many adults for work for lengthy periods.

It has been the experience of many observers that what Nature or Nature and mercurials do in fom one to three years can be effected by one or two injections of salvarsan in three or four weeks.

There is marked improvement in the sanitary conditions of the district. Regular inspections and instruction consequent on the appointment of a whole-time sanitary inspector and the gradual establishment of latrine accommodation in the villages are working a great change for the better.

Seventy-seven successful vaccinations were performed. The lymph supplied gave good results.

Sanitary inspection of premises and swamps were carried out regularly. There are two malarial spots in this district, the area surrounding the Grand Sable river mouth and that about the mouth of the Byera stream. Owing to tides and flooding of the streams in the rainy season swamps are formed and last for months each year. Repeated attempts have been made by the Way Wardens to drain these areas but without success.

C. M. Austin, M.B.

Report of No. 6 District.

Belle Vue Hospital,
Carriacou,
May 21, 1920.

Estimated population, 2,043; births, seventy-five; deaths, twenty-one; stillbirths, one; birth-rate per thousand, thirty-seven; death-rate per thousand, ten.

Remarks on Particular Diseases.

Only four cases of malaria were seen. No deaths.

One case of congenital syphilis in an infant was seen which resulted in death.

Two cases of pulmonary tuberculosis were seen, one male and one female. Death resulted in each case.

Twenty-eight successful vaccinations were performed.

The sanitary condition of the district has greatly improved, especially at Union Island. This, no doubt, is due to the vigilance of the District Officer, Mr. Osment, who deserves praise for the interest he manifests in the sanitary condition of the island.

The draining of the swamp at Ashton, Union Island, has removed what was an ever-present danger to the health of the inhabitants, and to it is due the almost entire absence of malarial fever in that community.

E. de J. McSween.

Report on the Colonial Hospital.

Colonial Hospital,

April, 1920.

The total number of cases treated at the hospital for the period under review was 885.

Notwithstanding the removal of all ulcer cases from the hospital, the admissions have kept up to the average of the previous four years.

Of the cases admitted to the wards of the General Hospital abscesses and intestinal parasites head the list with sixty-one cases each, malaria with forty-seven cases, and tertiary syphilis and gonorrhœa with thirty-eight and twenty-one cases respectively.

There were forty-five deaths, including one in the Graham Wing, giving a death-ate of 5·08 per cent. of the total number of cases treated.

The number of cases admitted to the Maternity Department maintained as a training school for midwives was ninety-seven, including four cases of abortion.

Four probationer nurses completed their course of training, and after examination were granted certificates to practise as midwives.

There were 2,342 patients treated at the Out-Patient Department, which is also the dispensary for the Kingstown District—of these forty-seven died, giving a death-rate of 20·06 per thousand.

Of the cases applying for treatment "catarrhal fevers" head the list with 164 cases with six deaths. Malaria accounts for thirty-one cases with one death. Syphilis accounts for sixty-three cases with four deaths from the late manifestations of the disease. The diarrhœal diseases of children provide fifty-eight cases with twelve deaths, and pulmonary tubercle twenty-six cases with four deaths.

Of Zymotic diseases, there were three cases of chicken-pox and eight cases of measles recorded.

Cyril H. Durrant, M.B.,
Colonial Surgeon.

Report of the Chief Health Officer.

Kingstown,

April, 1920.

The general health of the Colony has not been disturbed by any particular epidemic of importance during the period under review. Of diseases notifiable under the Public Health Ordinance, 1910, there were three cases of chicken-pox, three cases of enteric fever with one death, one case of leprosy with one death, seventy cases of measles with one death, 192 cases of yaws, and 124 cases of tuberculosis with twenty-seven deaths. Malaria fever has shown a slight decline, 273 cases with eleven deaths in the nine months being recorded as against 354 cases with seven deaths in the previous year.

The supply of milk has been of uniform quality. It is regrettable that it has not been found possible to fill the office of Supervisor of Milk Supply so as to ensure frequent inspection and examination of the milk. The medical examination of all cow-keepers and milk sellers has been carried out regularly.

These factories have been frequently inspected during the period under review, and every effort made to maintain their sanitary condition. The employees engaged in them have been regularly examined, and no prosecutions have been entered for breaches of the Regulations.

The sanitary condition of the Colony has on the whole been well maintained. The District Sanitary Police Reports on the inspections of villages and small towns of the Colony continue to show careful inspection work, and I note with satisfaction that my remarks on the subject of "Soil Pollution" have been more closely followed by inspectors generally.

With regard to the town of Kingstown, I must again draw attention to the general disregard paid to the Regulations dealing with the disposal of "night soil" and to the continued use of certain portions of the sea shore for latrine purposes by children. Strict supervision is required here to prevent this nuisance being created. The continued fouling of the North River as it passes through the town continues unabated. More attention should be directed to the cleansing and disinfecting of drains and street gutters, and a strict look-out kept for potential breeding grounds of flies and mosquitoes.

During the nine months 4,336 rats were examined for plague infection. No infected rats were found.

Ankylostomiasis Prevention.

The sanitary preventive work of providing fly-proof latrines of an approved pattern in view of the important part it plays in the eradication of the disease has proceeded throughout the period under review. 430 new latrines have been erected.

Cyril H. Durrant, M.B.,
Chief Health Officer.

Colonial Medical Reports.—No. 137.—New South Wales.

REPORT OF THE DIRECTOR-GENERAL OF PUBLIC HEALTH, NEW SOUTH WALES, FOR THE YEAR 1919, WITH ABSTRACTS FROM THE REPORT ON THE INFLUENZA EPIDEMIC, 1919.

By ROBERT T. PATON.

Director-General of Public Health.

Pure Food Act.

Considerable stocks of deteriorated foods, unfit for human consumption, found on traders' premises, were seized and condemned. It was also found necessary to seize and have repacked at the port of entry several large consignments of tinned food.

The milk supply of the metropolis and of country districts received special attention. It was found necessary to prosecute 178 traders for selling adulterated milk, and fines and costs amounting to £971 were recovered. Special attention was also given to milk-carts and milk-vendors' premises.

Although some 140 officers in the employ of local authorities have been authorized by the Board of Health to take samples, and otherwise carry out different provisions of the Pure Food Act, great laxity and neglect is shown by many of the Shires and Municipal Councils in this important matter. In many districts not one sample of milk was collected from the local dairymen or milk-vendors during the year, and in many others, where the matter was not wholly neglected, less than twenty-five samples were taken. To ensure purity of the milk supply it is absolutely essential that samples should be taken every week. On the other hand, some local authorities have shown commendable zeal in carrying out the provision of the Act, and have requested the Board to authorize the local inspector as a Pure Food Officer under Section 22 of the Act. Many of these officers have accomplished very useful work in connection with milk supervision, particularly by regularly taking samples of milk during its delivery to the public, and forwarding them to the Government analyst for testing.

Foods and drugs other than milk have received special attention, and numerous samples have been taken and analysed, and, when necessary, legal proceedings instituted. Premises used for the preparation of food received regular and close supervision.

Imitation Foods.—During the year a regulation was gazetted making it illegal to have on a label the word "imitation" or any word implying that an article is a substitute for any article of food, or may be used as a substitute for any food.

Registration of Eating-houses, Butchers' Shops, Smallgoods Premises, &c.—The necessity for the licensing of premises used for preparing and serving food is imperative; definite recommendations on the subject have been made from time to time, and such licensing was provided for in the Public Health Amendment Bill forwarded in 1916. Unfortunately this Bill has not yet been submitted to Parliament. Last year 106 eating-house proprietors were prosecuted for dirty premises.

Uniform Pure Food Laws for Australia.—It was agreed at the Premiers' Conference of 1918 that this State should prepare a Bill which would form a workable basis for the adoption of uniform pure food legislation throughout Australia. The Bill has been prepared and is awaiting submission to the Premiers' Conference.

Preservation of Fresh Meat.—A process in which sulphur products are used for the preservation of fresh meat has been under serious consideration by the Pure Food Committee for some time. The Committee is opposed to extension of the use of sulphur as a preservative, and has recommended that an exhaustive inquiry be made before it will either allow or condemn the use of the process.

Veterinary and Dairy Inspection Work.

The work carried out by this branch is of very great importance. The testing of dairy herds to ascertain their freedom from tuberculosis is one of the potent factors in limiting the spread of this insidious and fatal disease, and regular inspection of dairy premises and utensils afford the only effective means of securing a clean milk supply. With the present small staff and the great increase in dairying, too long a time frequently elapses between the visits of the departmental inspectors. In such circumstances, if local authorities are at all lax, dairymen are apt to become careless.

Model Dairy.—Plans of a model dairy have been prepared in order that dairy-farmers who erect new buildings may construct them in accordance with designs approved by the Department. When approved, they will be printed and made available for purchase.

Public Health Amendment Bill.

Suggested amendments to this Act were forwarded in 1916, but have not yet been submitted for Parliamentary sanction, although they were considered to be very urgent. During the year

further alterations and additions considered necessary in the public interest were prepared and forwarded for inclusion. The influenza epidemic accentuated the necessity of the legislation referred to.

The legal registration of nurses and midwives is another urgent matter. The opening of maternity hospitals by the State makes it imperative that the nursing profession should be given a legal status.

Importation of Bacteriological Products and Sera.

This is a matter of very great importance in connection with the treatment of illnesses of various kinds, and the Board of Health forwarded a protest to the Commonwealth Government against the proclamation issued by it in November, 1919, prohibiting the importation into the Commonwealth of bacteriological products and sera, except under licence from the Minister of the State for Trade and Customs.

Health Organization in Country Districts.

It is proposed to establish five additional districts each in charge of a medical officer of health, who will reside in the most populous or most convenient centre, and will keep in constant touch with the local authorities embraced in the combined district. Recent legislation in the adjoining State of Victoria has been on these lines, and the tendency throughout Australia, as well as in other portions of the Empire, is towards the establishment of whole-time medical officers of health in charge of combined districts.

Infectious Diseases.

Typhoid Fever.—The number was still lower in 1919 than in any previous year, the number notified for the two years being respectively 804 in 1918, and 782 in 1919.

Anti-typhoid Inoculation.—A few country towns took advantage of the Department's offer to supply anti-typhoid vaccine to local authorities free of cost for public inoculation depôts. The vaccine is prepared in the departmental laboratories, and is always available for public inoculation free of charge.

Malaria.—In 1915, when a number of military and naval men returned from New Guinea and Egypt suffering from malaria, this disease was made notifiable, in order that any necessary measures might be taken to prevent spread of infection. Towards the end of 1919 it was considered that the proclamation was no longer necessary and was revoked on November 28.

It was considered advisable to withdraw the proclamation as soon as it was ascertained that no extensive spread of the disease in New South Wales was probable. The hardships imposed upon the families of notified persons under the existing Public Health Act are of so serious a nature in the case of the disease, which may persist in the individual for a lengthy period of time, that it was regarded as improper to continue the notification of a disease, which after all is not directly contagious from person to person.

In the report of the Microbiological Laboratory is included an account of a case of malaria which appears to have been infected in this State. Only one other case has been recorded up to the present time, where the infection is believed to have been locally acquired.

Lady Edeline Hospital for Babies and Convalescent Homes at Rose Bay and Eastwood.

The convalescent homes and the Lady Edeline Hospital for Babies have continued their good work. During the influenza epidemic all these institutions were closed to their ordinary patients, and were used as emergency hospitals; in addition the Lady Edeline Hospital was used as a convalescent hospital for men towards the close of the epidemic, when the demand for beds for acute cases could be met by the other hospitals. From September onwards they reverted to their proper function, in the case of Carrara and Denistone House, in caring for patients recovering from lengthy illnesses or serious operations; and the Lady Edeline Hospital again admitting sick infants. At present there are twenty-six babies in this hospital, and although new patients are admitted daily, the matron reports that up to the present time, this summer, there have been few cases of the severe septic type of gastro-enteritis coming under treatment.

Action in connection with provision for maternity cases, whose circumstances do not permit them to be properly nursed in their own homes, has resulted in the preparation of plans for standard hospital units to be attached to country public hospitals. The unit provides for four maternity beds, and is so designed that it permits of easy expansion to meet the bed requirements of a growing district.

Dr. Robert Dick, in his report on the Hunter River Combined Districts, states that, among the more important matters requiring attention in the Newcastle district are provision of an infectious diseases hospital, a convalescent hospital, district nurses for visiting, a steam disinfecting plant for treatment of infected articles, a venereal clinic, a whole-time Pure Food Inspector, and increased housing accommodation and improvements to the many insanitary dwellings which at present exist in this district.

Venereal Diseases Act, 1918.

Considerable progress has been made in relation to the prevention and treatment of veneral diseases. Provision has now been made for the indoor treatment of male patients, while beds for female patients have also been provided.

Progress has also been made by establishing clinics for the treatment of outdoor patients. The Department was also in communication with country hospitals on this important subject, and

hospital committees received instruction regarding the procedure to be followed in the treatment of both indoor and outdoor patients, and for obtaining any special drugs required for treatment.

Microbiological Laboratory.

The influenza outbreak was the cause of a large increase in the work of the laboratory. Investigations into the ætiology, pathology and bacteriology of the disease, with animal inoculations and post-mortem examinations entailed a large amount of work on the part of the staff, which was further increased by preparation of large quantities of influenza vaccine.

Chemical Laboratory.

Dr. Cooksey draws attention to the occurrence of another death from the use of impure barium sulphate in X-ray diagnosis, and to the necessity for hospital and other public authorities who use drugs in large quantities to have their purity tested before being taken into use.

The Medical Superintendent of the Coast Hospital reports that the outstanding feature of the year's work was the influenza epidemic. The epidemic involved the expansion of the ward accommodation to its utmost, and necessitated the use of Yarra House (a mile distant) for convalescent patients.

Tuberculosis.

The Medical Superintendent of the Waterfall Sanatorium reports that open air and general sanatorium treatment gave the best results, with the use of tuberculin in suitable cases. Trials were made with Lo Monacos saccharine treatment, chloramine T., and sodium morrhuate (a salt prepared from cod-liver oil), to test their curative effects. The two first-mentioned preparations have been discontinued, as no good results were obtained. Although very little beneficial result was noticeable from the use of sodium morrhuate after three months, it was decided to test it for a further period as soon as a fresh supply could be obtained from India.

Influenza.

The Medical Superintendent succeeded in protecting the whole institution from involvement in the epidemic by enforcing the strictest isolation of cases and contacts, and thorough masking. Virulent influenza was introduced into the sanatorium on fourteen occasions, but only three deaths resulted, and only eight cases arose by contact with the infected arrivals.

Chief Sanitary Inspector's Branch.

The officers attached to this branch rendered very valuable services in connection with organizing and inspectorial work required by the influenza epidemic; and for some months regular inspections had to remain in abeyance except in cases requiring urgent attention. One important matter which had perforce to be neglected was country town inspection.

Urgent Need for Accommodation for the Staff of the Director-General of Public Health.

Again I must stress the urgency of this matter. Portion of the old Water Police Court buildings were handed over to the Department, and was utilized during the influenza epidemic for inoculation purposes, and for distribution of vaccine to suburban and country depôts. Circumstances exist here which would not be permitted in any other building in the city; the rooms are crowded, and in some of these there is no window or door which opens to outer air; in the Microbiological Laboratory officers remaining in during the luncheon hour must eat their food in the same rooms as infectious material from typhoid, diphtheria, consumptive and similar cases are handled from morning till night. Here again the influenza epidemic accentuated the dangerous inconvenience arising from the defective accommodation for the administration of the Department.

Appreciation of Staff.

I have already referred to the devotion to duty displayed by my staff during the unprecedented demands made upon them by the influenza epidemic, and to the marked organizing ability and resourcefulness shown in overcoming the difficulties which arose during the early weeks of the first wave of the epidemic, when there was some trouble in getting the public to realize that all must take their share in the common burden, and render help to stricken households by nursing at home those whose circumstances were such that they could be reasonably cared for, and leaving the hospitals with their limited staffs free to receive virulent cases, and those without homes. At no time did any of my staff fail in any of the demands made upon them, either during the epidemic or since, in adjusting the arrears of work which necessarily accumulated during its continuance.

Report of the Chief Sanitary Inspector.

The amount of general work carried out was considerably less than usual owing to the outbreak of pneumonic influenza with which the staff was fully occupied during the first half of the year. Five of the officers contracted influenza, but fortunately soon recovered.

During the early part of the outbreak, when infected premises were quarantined and contacts subjected to inhalation treatment, cases were dealt with by the staff in the city and suburbs; infected premises were visited; and premises quarantined, which often entailed reinspections. Arrangements for food supplies, care of children, and police guard were necessary. Inhalation treatment by means of small portable apparatus was given to contacts at 398 premises. Numerous contacts also who had left the infected houses, were traced, placed in quarantine, and a large proportion of them induced to submit to inoculation. One large inhalation chamber for use of the public and one small chamber for the

general staff were fitted up and kept in working order.

With a few exceptions the local authorities deserve much credit for the manner in which the work of attending to the stricken people and their dependants was carried out, and also for the assistance given to this department.

Notifiable Infectious Diseases.

Under the Public Health Act, Part III. the Governor may, by Proclamation in the *Government Gazette*, declare that any disease therein named is an infectious disease. This part of the Act was brought into operation on January 1, 1898, when scarlet fever, typhoid fever, and diphtheria were proclaimed infectious diseases for the purpose of the Act. In 1900 bubonic plague was added to the list, and infantile paralysis (acute anterior poliomyelitis) in 1912. In 1915 two other diseases (acute malarial fever and epidemic cerebro-spinal fever—meningococcal meningitis) were proclaimed as infectious. Pneumonic influenza was proclaimed a notifiable disease on December 6, 1918. So far as is known, the first case of this disease which occurred in this State (outside the quarantine area at North Head) was reported on January 24, 1919, and between that date and August 6, 1919, when the proclamation was withdrawn, 21,731 cases were notified. On November 28 malaria was withdrawn from the list of notifiable diseases.

Metropolitan Combined Sanitary Districts.

Report of the Medical Officer of Health.

The relation of health to congestion of population is a close one. It has been recognized that the crowding of people into houses, and the crowding of houses on an area, are two features which affect the population.

Whilst the vital statistics indicate that the general health of the people of the metropolis is satisfactory, there are some conditions which suggest need for improvement. There is an undoubted house famine.

Although the main notorious slum areas were wiped out years ago, there are still undesirable congested areas.

As pointed out in evidence before the Inter-State Housing Commission, the greater number of dwelling-houses within these areas are old, squatty in design, poor in construction, and of that type commonly known as "jerry built."

Now that the war is over it is hoped that the resumption schemes, temporarily in abeyance, will be resuscitated and continued.

An average dwelling should contain living room, scullery, and three bedrooms, a wash-up sink, a copper, a bath, and w.c. The scullery should adjoin the kitchen and living-room, and it should be possible to do all cooking in it, so as to render the living-room more pleasant as a sitting and eating room.

Environment exerts a potent influence on character. Under depressing surroundings a decent tenant is apt to become indifferent, and it is hard for a housewife to take pride in a house that can never do credit to occupier or landlord.

A city which not only in name embraces socially and commercially one community, with streets continuous or contiguous, with one water supply, one drainage system at present controlled by two-score or more representative bodies, calls for one responsible authority in order to co-ordinate and extend improvements in sanitation. My experience as District Health Officer in Auckland, New Zealand, and later as Chief Health Officer of Tasmania, demonstrated to me that any movement to deal with planniug for the future on a comprehensive scale, such as the provision of the re-housing of those displaced by the condemnation of property beneath a habitable standard, was handicapped by the inability of the main central municipal authority to control the extension on sound lines of the development of the adjoining areas.

The immediate and pressing needs of the future in the metropolis urgently call for the increase of better housing accommodation if the standard of health is to be maintained or improved.

Meteorology.—Information supplied by the Sydney Meteorological Bureau shows that the mean temperature of the air in Sydney during 1919 was 64·9° F., which is 1·8° higher than the mean of sixty years' observation.

January and December were the warmest months of the year, whilst July was the coldest.

Hunter River Combined Sanitary Districts.

There has been a steady decline in the number of notified cases of enteric during recent years. A large number of troops have returned to this district from abroad, a certain number of whom no doubt suffered from the enteric group of fevers, and a percentage of "carrier" cases might be expected amongst them. This factor has had no apparent effect so far in leading to any increase in the number of enteric cases in this district.

Enteric cases are treated in the district hospitals in wards along with other medical cases. No special accommodation is made available for them. The wisdom of carrying out the preventive inoculation of the nursing staffs in all hospitals against the enteric group of fevers needs to be brought to notice.

Pneumonic Influenza.—All cases which required hospital accommodation in Newcastle and suburbs were treated in emergency hospitals at Waratah and Wallsend. At West Maitland, Kurri Kurri, and Cessnock emergency hospitals were also equipped and availed of. Considerable difficulty was experienced in keeping up the staffs of nurses at these hospitals. A very large percentage of the nurses and attendants took the disease at one time or another, but it is very satisfactory to record that of the large numbers employed only two nurses died from the disease.

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Quarantine restrictions, masking, and preventive inoculation were put into practice extensively at the beginning of the epidemic in the hope of preventing its spread, but these all failed to arrest it. Then steps were taken to organize nursing assistance for the home treatment of patients, to issue free supplies of medicine and blankets, the establishment of soup kitchens, and the delivery of foods to the houses of those stricken down. Patrols were established to bring to notice cases requiring assistance. A number of the Municipal and Shire authorities did very good work in these directions, and they were actively supported by Red Cross organizations, mission, industrial, and other societies. The police authorities also did very useful work.

In regard to the question of possible increase in the prevalence of certain diseases following the return of troops from abroad, it may be said that as far as this district is concerned nothing striking has been brought to light during the past year. The principal diseases which may be considered in this connection are the enteric group (typhoid and paratyphoid fevers), trench fever, malaria, venereal diseases. The question resolves itself principally into one of conveyance of infection by "carrier" cases. In regard to the enteric group, the preventive inoculation with a mixed vaccine at yearly intervals practically abolished typhoid and paratyphoid from the Allied armies.

Infectious Diseases Hospital.—During the influenza epidemic temporary isolation hospital accommodation was provided in the Benevolent Society's premises at Waratah.

Four temporary huts were also erected in the grounds of that institution to provide extra accommodation for sixty beds. After the influenza epidemic had subsided, these premises were handed back to the previous occupiers. The Government has for some time had under consideration the question of building a modern isolation hospital on land which was reserved for this purpose over ten years ago. This land, comprising 15 acres, is situated immediately at the rear of the premises which were used for influenza cases. I understand a sum of money was placed on the Estimates towards the cost of building this hospital, and plans are being prepared, but up to the end of the year nothing had been done in the way of starting this building. The whole question of hospital accommodation for the Newcastle District is in an unsettled state. As to the absolute necessity of providing adequate accommodation for the isolation and treatment of cases of infectious disease, there can be no doubt whatever. The present isolation accommodation provided at the Newcastle General Hospital is inadequate and unsuitable for the purpose, but until some definite policy is adopted in regard to hospital accommodation in general, and that for infectious diseases in particular, the present difficulties will continue.

THE COAST HOSPITAL, SYDNEY.

The influenza epidemic was the main feature of the year; 2,966 cases were treated, of whom 313 died. There were sixty-three cases admitted during the fortnight ending February 11, and subsequently the admissions rapidly increased to 371, 356, and 354 in the three fortnightly periods ending March 25, April 8, and April 22. There was then a lull, followed by a recrudescence in which 409 and 341 were admitted for the fortnight ending June 17 and July 1 respectively. After this the numbers rapidly fell again. The treatment of these cases, many of whom were very seriously ill, entailed very heavy work on the part of the medical and nursing staff, which had to be considerably strengthened for this purpose. It is very satisfactory to be able to note that, though many of the staff fell ill with the disease, there were no fatalities among them. Increased accommodation for convalescents was obtained by the temporary acquisition of the Eastern Extension Cable Co.'s former cable station at Yarra Bay. This was staffed and equipped for thirty-one beds, and between March 20, 1919, and August 23, 1919, 822 male convalescents influenza cases were treated here.

Of the 313 fatal cases, 252 died within seven days of admission to hospital, namely, seventy-one within twenty-four hours, forty-eight within two days, thirty-one within three days, thirty-four within four days, thirty within five days, twenty-two within six days, and sixteen within seven days.

EPIDEMIOLOGY AND ADMINISTRATION.

By W. G. ARMSTRONG.

EPIDEMIOLOGY.

Introduction.

The State of New South Wales was invaded during the year 1919 by the greatest pandemic of modern times. It had previously attacked Europe, America, Africa, Asia, and New Zealand, and wherever it had struck it had been most deadly. From Australia it was fended off for a period of nearly three months by the Commonwealth Quarantine, but eventually this barrier appears to have failed.

The invasion of Australia first took place through the State of Victoria, from which it spread throughout the continent, reaching New South Wales on January 27. The toll of life taken by the epidemic in this State was extremely large, amounting to no less than 6,244 deaths, of whom 3,770 were males. The disaster was accentuated by the fact that the classes to whom the epidemic was most fatal were the young adult males and pregnant women, who could least well be spared to the country. Australia had been in an exceptionally favourable position as regards the epidemic, inasmuch as it had, unlike almost any other country invaded, received plenty of warning of the nature and virulence of what was to come. The warning was by no means neglected.

Every possible provision was made, compatible with the complete ignorance of doctors and other scientific men all over the world as to the nature of the infection and the best means of combating it. A Consultative Committee of members of the British Medical Association was selected by the Association at the request of the Government and assisted this Department by their deliberations and advice. A prophylactic vaccine was manufactured in large quantities by the Department of Public Health, and was issued free of cost to medical practitioners and to the public; and public vaccination depôts were opened in large numbers both in the city and country. The public responded and presented themselves for vaccination in numbers entirely beyond anticipation. There was no great hope that the vaccination would prevent attacks of the disease, since it was not known which was the primary organism responsible for its causation; but in face of the fact that most of the severer complications of influenza are caused by secondary invading organisms which cannot make their attack except when influenza is present in the body, there seemed some grounds to believe that a vaccine prepared from these organisms would considerably diminish the mortality from the pandemic.

Provision was also made for special hospital accommodation up to the extent of 2,500 beds in the metropolitan area. This provision would, as the course of events demonstrated, have proved sufficient to meet the emergency, but unfortunately owing to the shortage of medical and nursing staffs due to the absence of large numbers of doctors and nurses from the State on war service, in the event it was found impossible to utilize more than 2,000 beds. This number proved for a short time at two periods of the epidemic to be insufficient to meet the demand.

The actual case mortality rate was not extremely high, for after very careful investigations it has been estimated that in the metropolitan area, approximately 290,000 persons, or 36·6 per cent. of the whole population, were attacked with influenza. As the total number of deaths in the same district was 3,902, the case mortality rate was only 1·3 per cent. of those who were attacked. The majority of the cases were, therefore, of quite a mild character, but the severer attacks were of an unparalleled degree of virulence as far as this State's experience of influenza goes.

When the disease actually invaded the State of New South Wales the Government put into force certain precautionary measures, most of which had been already decided upon. They included restriction upon travelling between Victoria and this State, and later on between Sydney and the country districts; the provision of hospital accommodation; the provision of medical and nursing assistance in the homes of the sick; the distribution of relief to afflicted households in the shape of food, drugs, and where necessary, monetary assistance; the notification of all cases of influenza; the isolation of patients and contacts; the restriction of public assemblies, including the closure of schools and churches; and the wearing of masks under certain circumstances. The general result of all these measures was undoubtedly to the good. Although they did not achieve all that had been perhaps hoped for them, they unquestionably checked the development of the epidemic for a considerable period, and prevented the explosive action which characterized this pandemic of influenza in many other countries of the world. This was, of course, valuable inasmuch as it gave time for the development of measures of relief, and prevented the dislocation of business and public utilities.

The provision of relief in the metropolitan district was handed over by the Government to a body created for the purpose under the title of the Influenza Administrative Committee, whose energetic operations greatly reduced the misery with which the worst stages of the epidemic were accompanied. They kept in touch with the households in the poorer neighbourhoods who were attacked by influenza, provided food and clothing; and in special instances gave monetary relief.

This Department was greatly assisted in the control of the epidemic by the metropolitan ambulance services and by the Red Cross Society. The former were largely expanded in anticipation of the great expected strain upon their services; were placed under one head for purposes of the epidemic, and were in close touch with the Department throughout, working day and night in the transport of the sick to hospital with great self-sacrifice. The Red Cross Society placed itself in touch with the Department, and did devoted work in supplying nursing services to afflicted households. A considerable number of depôts were established by this Society in conjunction with the Influenza Administrative Committee in the city and suburbs, and from these depôts invaluable medical and nursing aid was provided among the households of afflicted persons. At each depôt two nurses were employed; and the whole service was under the supervision of two medical women. The nurses and voluntary aids visited houses invaded by influenza; reported cases for removal to hospital; gave nursing aid to sick persons who could not be removed to hospital, and could not otherwise be provided with proper assistance at their homes. The operations of these depôts were materially assisted by the fifth-year medical students of the Sydney University, whose services were highly appreciated.

The epidemic developed two waves, the first of which reached its height in the middle of April, and was the most severe in type; but inasmuch as it affected very much fewer people than the second wave, was not accompanied by so many deaths. The peak of the second wave was attained about June 20 or 21. After this there was a rapid decline in the admission of cases into hospital, and the epidemic finally came to an end in the closing days of September.

On the value of the preventive measures adopted there is much to be said. They are discussed at

some length in this report. The statistical evideuce which has been accumulated by the Department indicates very clearly the high value of vaccination as a means of diminishing the more severe complications, and the loss of life accompanying influenza.

The task of fighting the epidemic was, as may be imagined from the above brief account, a work of very large dimensions, and could not have been achieved without a great amount of self-denying and unremitting labour ou the part of everyone concerned. The services rendered by the hospitals and their staffs and the medical profession in general were beyond all praise; without them the epidemic could not have been fought in the most elementary way. The school teachers of the Education Department gave assistance freely whenever and wherever it was required, particularly in connection with the relief depôts. In many instances also, the Education Department by the loan of its school buildings for emergency hospitals, met local demands which could not have been otherwise satisfied. The Medical Branch of the Education Department under its late lamented chief, Dr. C. S. Willis (whose death due to the epidemic was most deeply regretted on all sides), aided the efforts of the Department of Public Health in overy directiou. The local authorities throughout the State, together with their officers in general, acted up to the high traditions of these bodies. In some instances the work carried out by municipalities and their officers was deserving of the highest commendation, those in the country districts in particular, inasmuch as in many cases local authorities had to be depended on entirely for local administration. The Country Influenza Administrative Board with its local representatives throughout the State (the local influenza committees) were in constant touch with the Department during the epidemic, and their services in the country districts, particularly those of the more out-lying and least populous parts, were invaluable.

Finally, even such a brief review of the epidemic as the one now presented could not be complete without an acknowledgment of the services of the officers of the Public Health Department. They, of course, bore the brunt of the struggle, as was inevitable; and they brought to it a degree of energy and self-devotion worthy of the highest encomiums.

The Nature of the Disease.

Influenza as it invaded New South Wales in 1919 was similar in all essential respects to influenza as it has appeared in this State previously on several occasions, and as it has appeared in other countries and at other times. It manifested itself as a severe, highly contagious acute disease, rapid, often sudden in its onset, very prostrating to its victims, prone to affect the upper respiratory passages, and particularly liable to merge into broncho-pneumonia of a highly fatal type.

In all of the above essential characteristics it conformed to the classical picture of influenza. The characters peculiar to this invasion were rather those of degree. The tendency towards bronchopneumouia was greater than has been observed in previous epidemics, the broncho-pneumonia when it appeared was more severe in type, and the proportion of toxæmic cases appeared to those medical practitiouers who had the opportunity of witnessing the 1890-91 epidemic in New South Wales to be excessively large. The heaviest burden of mortality was transferred from the elderly folk, who have usually died in the largest numbers in previous epidemics, to young adults. These differences in degree correspond to the characteristics of the late pandemic as reported in Europe, America and South Africa, and are without importance in the identification of the disease. In all its multiform manifestatious the influenza seen here was identical with that described elsewhere and here previously.

The incubation period in cases in which all the facts appeared to be clearly defined was rarely more than forty-eight hours, and frequently a few hours less. A few cases came under observation in which the incubation period appeared to have been prolonged to three days.

The onset was usually sudden, sometimes fulminating in its character. Instances occurred in which individuals were suddenly attacked by giddiness, muscular weakness and severe headache while walking in the street, and frequently patients stated that they had gone to bed feeling perfectly well, and a few hours later had awakened in a state of miserable illness. In women the onset appears to have been definitely less sudden than in men. When the nurses on the hospital staffs were attacked, the usual happening was that the nurse would report sick, but would be reassured on finding her temperature normal. A few hours later she would be found to have a raised temperature, and would be sent to bed. In some instances in both sexes the onset was much more gradual. Well-marked rigors were not always observed, but chilliness was common, and slight shiverings sometimes occurred and were occasionally repeated.

Coryza was not a usual symptom of the onset, but the face was usually flushed, the eyelids heavy and drooping, the conjunctiva injected, and the eyes glistening, the general appearance of the facies bearing a resemblance to that seen in measles, though in a less marked degree. Sore throat was very common, and the fauces and soft palate were almost invariably congested. Epistaxis was not uncommon. Tracheo-bronchitis, accompanied by a feeling of rawness or pain in the chest behind the sternum was commonly present. Pain in the head, back and limbs was common. The headache was sometimes generalized but more commonly frontal, and was very severe. Very often the pain was referred to the back of the lower limbs, to the scapular region, or the back of the neck. Abdominal pain was not a common symptom. Nausea was frequent and was occasionally accompanied by vomiting. Sweating was frequently profuse.

The temperature in the period of the onset rose to 102° F., 103° F., or 104° F., sometimes as high

as 105° F. The pulse-rate during the period of onset was increased, with the rise of temperature, but was usually relatively slowly almost from the beginning. Many cases closely resembled typhoid fever, and sometimes the differential diagnosis was difficult.

Muscular weakness and prostration were marked in all but the mildest cases. The patient said that he felt "rotten" and was glad to go to bed and stay there.

The statistics given in another part of this report show that of 12,786 patients treated in Sydney hospitals, 4,974, or 39 per cent., passed through their attack without exhibiting marked clinical signs of pulmonary involvement. They were and continued to be cases of "simple" influenza, and recovered without any serious complications. In these cases the temperature fell sometimes on the second or third day, more often from the fourth to the fifteenth day, after which rapid improvement set in. If the temperature fell during the first week it was frequently by crisis, but later on it subsided by lysis. But in the remaining 61 per cent. of the patients, pneumonic symptoms, whether severe or mild in type, made themselves manifest. It must be borne in mind that in using these figures one is speaking of hospital cases only —cases which in the main were selected for hospital treatment on account of the severity of the attack. Among patients who did not undergo hospitalization the presumption is that the proportion of "simple influenza" attacks was much greater.

The "Pneumonic" Cases.

In those patients who developed pneumonia the latter did not supervene at any definite stage of their illness. Sometimes the illness was "pneumonic" almost from the very first onset of the influenzal attack. More usually pneumonic complications were first observed about the third or fourth day, while in some instances the case was much further advanced before pulmonary complications set in.

The protean nature of the disease was in no direction more manifest than in the type and symptoms of the pneumonia which accompanied it. The only character common to all the pneumonic cases was that they were of the "broncho-pneumonic" type, which, unlike lobar pneumonia, does not run a definite clinical course nor pass through the pathological stages known as congestion, hepatization and resolution. In some cases large areas of lung gave the classical signs of consolidation, while in others nothing abnormal could be detected beyond a few rhonchi in either base. Every imaginable stage between these extremes was met with. One of the earliest physical signs was a harsh respiratory murmur followed by patches of moist râles situated at the posterior base of one of the lungs, perhaps a little more commonly on the left side. Sometimes the consolidation began at the extreme base and spread in a short time so as to involve the whole of the posterior surface of the lung. At other times patches showing the classical signs of consolidation appeared in various regions of the chest. Death was apt to occur at any stage of the process. Any prognosis based upon the physical signs in the lungs was in short very fallible.

At this stage of the disease the patient was very prostrated and sometimes apathetic. Symptoms of severe intoxication became apparent.

The tongue, which during the period of onset was large, flabby, indented by the teeth, and covered with white creamy fur, now became thickly furred on the base and on the dorsum with a dry brown fur. The tip and margins often remained clean.

The cyanosis which sometimes began to show itself before any physical signs were manifest in the lungs became more marked and the breathing became more rapid. Urinary retention was not uncommon.

The cough, at first dry, harsh and irritable, with an absence of sputum, became more hacking. Glairy muco-purulent sputa, expectorated with difficulty, followed. Usually the expectoration remained scanty, and was often streaked or extensively stained with bright blood. Occasionally severe hæmorrhages occurred. In a few cases the sputum was inclined to be rusty, but it had not the glutinous tenacity seen in the sputa of lobar pneumonia. The pulse-rate increased with the temperature, but not to a corresponding extent. Arterial tension was low, and a tendency to dicrotic pulse was not infrequently observed.

Probably the most striking clinical feature of this epidemic of influenza was the colour of the patient in the more severe cases. Even in quite moderate cases in which the signs of lung invasion were slight or nearly absent, there was frequently a tendency to cyanosis. With the onset of definite pneumonia the patient often became lilac- or lavender-hued. It is of course not uncommon in cases of pneumonia to get the dusky cyanosis of the face, with a definite purple tinge in the lips and ears. In this epidemic the colour was of a distinct quality, which can best be conveyed by saying that the whole of the face became lilac in hue. The prognosis in these cases was extremely grave. The occurrence of this type of coloration was chiefly during the first wave of the epidemic. During the second wave, although the severity of the epidemic was fully maintained, there were much fewer cases encountered of this particular lilac colouring, and as the second wave sagged towards its end this type of case ceased to be seen.

A remarkable characteristic of the severe pneumonic cases was the absence of orthopnœa. Even patients with lungs which must have been nearly solid, who were breathing very rapidly, usually preferred to remain flat in bed and did not wish to be propped up by pillows. The absence of respiratory embarrassment in influenzal pneumonia was conspicuous, and was in striking contrast with the distressing "air hunger" usually seen in lobar pneumonia.

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Sleeplessness, often of an extreme character, was a serious symptom generally in cases with severe pulmonary involvement, and occurred also in some instances in which the lungs were not manifestly extensively implicated. Capacity to sleep was a favourable sign. In general it might be said that patients who slept were likely to recover. Delirium was frequent in the more severe cases. The usual type to be experienced was that of the "typhoid" state—a low muttering delirium with carphology, twitching of the fingers, and passage of the dejecta in bed. Less often, the actively maniacal type of delirium occurred. In general, patients exhibiting either type did badly, but sometimes recoveries occurred from what appeared to be hopeless conditions. Patients who did not become delirious often displayed a remarkable and treacherous sense of well-being even when almost *in extremis*. They were quite sensible, did not make any complaints, and when spoken to expressed the opinion that they were doing very nicely.

Complications were on the whole few in number and uncommon in occurrence.

Albuminuria was fairly common, and the albumen was present sometimes in large quantities, accompanied occasionally by granular casts. No other clinical symptoms of nephritis occurred, and post-mortem examination disclosed no signs of nephritis.

Diarrhœa was sometimes noted, but more commonly there was a tendency to constipation. In a few cases the diarrhœa was so severe as to predominate over all other symptoms, but these cases were unusual. In fact, the whole epidemic was characterized by the rarity of both the so-called abdominal and nervous types of influenza described in modern text-books. The overwhelming force of the infection was expended upon the respiratory system.

Deafness with otitis media was fairly common, but not to such an extent as to be remarkable.

Hæmorrhages were rather frequent. The occurrence of epistaxis and blood-stained sputa have been already mentioned. Among women patients there was a strong tendency to uterine hæmorrhage, generally taking the form of untimely or excessive menstruation, which accompanied the onset of influenza even in mild cases. In a few instances the hæmorrhage was rather profuse. Pharyngeal hæmorrhages occurred in several cases, as also hæmorrhages from the bowel.

Pleurisy was a rare complication during the first wave of the epidemic, but occurred rather more often during the second wave, and was occasionally accompanied by small effusions of fluid, which rarely required tapping.

Other complications were rare. They included empyæma, unresolved pneumonia, thrombosis, peripheral neuritis, retention of urine, and pneumococcal infection of the urine, jaundice and cardiac complications.

Two general characteristics of the epidemic cannot be overlooked here. One—referred to elsewhere in this report—was the relatively light hand which the disease laid upon women and children (except pregnant women) compared with its effects upon men. This experience was universal. Both in the hospitals and elsewhere women and children suffered relatively less than men. The mortality figures from the twenty-five hospitals indicate that the case mortality (percentage of deaths to admissions) among all females was 10·8 per cent. Among all males the rate was 18·3 per cent., or about 70 per cent. higher, and the difference between the proportions of women and men who developed the most severe form of influenza (type C) was about the same.

The other observation cannot be supported by any statistics for obvious reasons, but it was none the less perfectly well known to all the medical officers and nursing staffs of the hospitals and to every other person coming into close personal relations with the epidemic. It was the overwhelming severity with which the disease attacked chronic alcoholics. Particularly during the first wave of the epidemic it was the common observation that the prognosis in the case of the confirmed heavy drinker was generally bad, and patients of this class were always watched by the medical staff with great anxiety.

Influence of Influenza on Pregnancy.

Records are available of 224 pregnant women who were admitted into influenza hospitals in Sydney during the epidemic (of whom 142 were treated in the South Sydney Women's Hospital). Of the total number, sixty died and 164 recovered. This is equal to a case mortality rate of 26·7 per cent. The number stated to have been previously inoculated with prophylactic vaccine was twenty-one, and of these two, or 9·5 per cent., died. Among the 160 women stated not to have been inoculated there were forty-nine deaths, which is equivalent to a case mortality rate of 30·6 per cent. In forty-three instances information as to inoculation was not obtained. In this group there were nine deaths—a case mortality rate of 21 per cent.

Among forty-one women who had completed the full term of pregnancy there were nine deaths and thirty-two recoveries of the mother. The child lived in twenty-nine cases.

The number of premature births (6th-8th months) was forty-six. In this group twenty-one mothers died and twenty-five recovered.

The number of miscarriages (up to the fifth month of pregnancy) was twenty-one, with eight maternal deaths.

The number of pregnant women in whom pregnancy was not terminated by the attack of influenza was 105. Among these women there were twenty deaths and eighty-five recoveries.

In eleven instances the records do not indicate whether the pregnancy was terminated or otherwise. In two of these cases deaths occurred.

Origin and Mode of Spread.

During the year 1918 most of the world, excepting Australia, was ravaged by a pandemic of influenza of a more severe type than any recorded

at least during the last hundred years; popularly supposed to have originated in Spain, and therefore frequently designated "Spanish Influenza," it invaded England in May, June and July, and after a brief remission reappeared there in the form of a second epidemic wave of a more virulent type of influenza in October and November.

The pandemic reached America in September, South Africa in September, and New Zealand in October, 1918. In all of these countries it spread with great rapidity and caused an appalling mortality. In the Union of South Africa it was officially estimated to have caused in four months 139,471 deaths, of which 11,726 were European; and in New Zealand, possessing a total population of 1,160,000, the epidemic caused within twelve weeks no less a mortality than 6,601.

Early in October—warned from official and unofficial sources that the pandemic was approaching Australia and was of a type of unparalleled virulence—the Commonwealth Quarantine Department issued instructions to the quarantine officers in all Australian ports to quarantine on arrival all vessels on board of which any cases of influenza had occurred during the voyage. All vessels arriving from New Zealand or South Africa were quarantined on arrival for seven days' observation, even if uninfected.

On October 25, 1918, a vessel arrived in the port of Sydney from New Zealand with cases of influenza on board. She was ordered into quarantine at North Head. From this date onwards until January 30, 1919, infected vessels continued to arrive in Sydney, and the quarantine station at North Head was not free of influenza patients.

The quarantine stations of Australia are, as already indicated, under the control of the Commonwealth authorities, and are not accessible to health officials of the States, but it is understood that between the two dates mentioned 326 persons who were members of the crew or passengers on infected incoming vessels were treated for influenza in the quarantine hospital at North Head, and forty-nine deaths from the disease occurred there.

During the period of quarantine numbers of contacts and recovered patients from the quarantine station were being constantly set at liberty after having, in the judgment of the quarantine officers, become clear of infection, and were passed into the general population of Sydney. This action was at first regarded with a certain amount of apprehension by officers of the New South Wales Health Department, who dreaded the possible existence of "carriers" among the patients discharged from quarantine, or those who had been in contact with them. In consequence persons known to have been discharged from the quarantine hospital were, as far as possible, kept under observation by the State Department of Public Health for periods ranging from a few days to weeks. In no case did any suspicion arise that such persons had spread infection among those with whom they came in contact. Two of these cases are worthy of special record. In both instances the subjects were nurses who had been engaged nursing influenza patients in the quarantine hospital at North Head and themselves contracted the disease. After recovery and a period of isolation they were discharged from quarantine, and resumed their ordinary lives among the civil population. Both complained of slight persistent throat trouble, which led them to seek advice, and on swabbings being obtained from their naso-pharyngeal cavities these were found to contain abundant organisms, among which were identified Pfeiffer's influenza bacillus, micrococcus catarrhalis, pneumococci and staphylococci. Subsequent swabbings after intervals of a month demonstrated the persistence of the influenza bacillus in each case. On inquiry it was ascertained that no case of influenza or infectious catarrh had occurred among persons who came into contact with either of these nurses, one of whom was a temporary occupant of several different households during the time she was under observation.

The earliest invasion of this State by the pandemic was well defined, and was from the adjoining State of Victoria, from which it was carried to Sydney by certain returned soldiers.

During the early days of the epidemic, while there still seemed to be a possibility of checking its progress, the policy of the Department of Public Health towards influenza patients was vigorous and strict.

It seems very probable that the slow progress of the epidemic at its first invasion was due to these stringent measures and to those (restriction of assemblies, compulsory masking, &c.), but though such measures may have been of value in checking the rapidity with which the disease spread and so preventing the swamping of hospitals, they were unable to bring the epidemic to a halt.

The weather during the course of the second wave was very unfavourable, and was marked by a succession of strong and cold westerly winds of the type that is usually accompanied by the occurrence of many cases of pneumonia when they prevail in Sydney in the winter months.

An interesting comparison of some of the characteristics of the two epidemics (those of 1918 and 1919) as they affected the town of Lithgow, has been forwarded to Dr. A. T. Chapple, who practised at Lithgow during both epidemics, and is worth quoting here. "In both epidemics," he says, "infectivity was high, but that of 1919 was most infectious. All the doctors here agreed that the two epidemics resembled each other closely, though that of 1919 was more severe. The attack in 1918 did not protect the individual entirely against the 1919 epidemic, and many persons in Lithgow were attacked in both epidemics. Those who had the complaint in 1918 seemed to recover more rapidly when they were again attacked in 1919 than those who were not previously attacked, and their illness was not quite so severe. In 1919 I noticed that if the patient was of the fat, thick-necked type, the outlook from the beginning was bad. Generally, such people became rapidly cyanotic and died. In 1918 I did not notice this.

In 1919 pregnant women showed a marked tendency to abort if attacked by influenza. This was not the case in 1918."

The theory which appears best to fit in with all the circumstances, as far as this continent is concerned, is that two separate infections reached Australia; one of low virulence in August, 1918, and the second of highly intensified virulence which actually reached Australia in January, 1919, and would have reached us in October, 1918, had it not been for the operation of the quarantine cordon. There are no difficulties in accepting this hypothesis.

It is convenient to refer here to the manner of the introduction of the epidemic into the city and port of Newcastle, which was instructive from several points of view.

At the time of its occurrence Newcastle is believed to have been quite unusually free from infectious colds and catarrhs of any sort, and, therefore, the phenomena attending this outbreak were not obscured by any confusion arising from difficulties of diagnosis between the exotic and indigenous types of influenza.

On February 25, a seaman, A.B., aged 28, was admitted into D ward of the Newcastle Hospital from the s.s. *Ooma*, which had that day arrived from Melbourne. A.B.'s illness had been diagnosed as typhoid fever by the surgeon on board the *Ooma*, and his wife, who was also a medical practitioner. On arrival at Newcastle the Acting Port Health Officer saw A.B., concurred in the diagnosis of the ship surgeon, and recommended the seaman's admission into the hospital. He was seen also by several members of the honorary and resident medical staff, all of whom agreed with the diagnosis of typhoid fever.

The patient went down hill and became cyanosed, and on the evening of Sunday, March 2, the medical staff considered the possibility of the case being one of pneumonic influenza. That night he died, and within twenty-four hours of his death, five nurses, two wardsmen, one of the honorary medical staff, and six patients in D ward had all become attacked by the symptoms of influenza. Before the Newcastle Hospital was cleared of the disease thirty-five persons were infected there.

A post-mortem examination of A.B.'s body disclosed no evidence of typhoid fever, but the findings were those of death from pneumonic influenza.

Between the time of A.B.'s admission and his death a good many visitors were admitted to the ward in which he lay. Probably a proportion of those persons became infected and took the infection home, and by March 12, i.e., ten days after A.B.'s death, cases of influenza began to come under observation in neighbourhoods distant from the hospital. From thenceforward the infection gradually spread in Newcastle.

Closely allied to the question of susceptibility is that of the protection acquired by means of a previous attack. Here again the experience of the hospital staffs is of interest. Among the 1,488 members of these staffs there are four recorded instances of persons being attacked twice by influenza during the epidemic. Two of these were nurses and two were wardsmen. In all cases the second attack was very mild. The duration of time which elapsed between the first and second attacks was in one case five weeks, in two cases two months, and in one case ten weeks. Generally speaking, nurses and wardsmen who had already suffered an attack of influenza during the current epidemic were found to be immune to further attacks, and whenever it was possible such nurses and wardsmen were employed in the influenza wards of hospital in preference to persons who had not been attacked.

A unique opportunity to exploit to the full the value of protective inoculation against influenza was enjoyed in Australia.

Dr. J. B. Cleland, the Principal Microbiologist of the New South Wales Department, obtained from the fresh sputum of patients suffering from influenza at the Sydney quarantine station a number of strains of the organisms found in the greatest profusion. These strains were afterwards supplemented by certain strains obtained from the Commonwealth Serum Laboratories in Melbourne and from the Professor of Pathology at the University of Sydney (Professor D. A. Welsh), and from them a mixed vaccine of the following composition was prepared. Each cubic centimetre contained:—

Pneumococcus	1,000	millions
Influenza bacillus ...	100	,,
Streptococcus	100	,,
Staphylococcus aureus ...	250	,,
Gram negative micrococcus	250	,,

Dosage recommended: An initial dose subcutaneously of a ½ c.c., followed seven days later by a dose of 1 c.c.

The above vaccine will in future be referred to as the State vaccine. It alone was used in most of the country districts of New South Wales, but in Sydney at one period the rush for protective inoculation amongst the public was so great that the available supplies of the State vaccine were inadequate to meet the demand, and supplies of the vaccine manufactured at the Commonwealth Serum Laboratories in Melbourne were obtained to supplement the stock of local vaccine. Even with this reinforcement it was found difficult to produce the vaccine in the quantities required, and for a period of two weeks—from February 2 to February 17—the State vaccine was used in the public vaccination depots in half the quantities indicated above, i.e., ¼ c.c. for the first dose and ½ c.c. for the second dose

The composition of the Commonwealth protective vaccine as announced officially was as follows. It was made up in two strengths:—

A. Strength per cubic centimetre:—

B. influenza	25	millions
M. catarrhalis	25	,,
Pneumococcus	10	,,
Streptococcus	10	,,
A Gram-positive diplococcus	10	,,

(not pneumococcus) isolated from all the cases examined.

B. Strength per cubic centimetre:—

B. influenza	125	millions
M. catarrhalis	125	,,
Pneumococcus	50	,,
Streptococcus	50	,,
Gram - positive diplococcus	50	,,

As used in New South Wales 1 c.c. of "A strength" constituted the first dose, and 1 c.c. of "B strength" the second dose.

The experience gained during the epidemic on the question of the prophylactic effect of inoculation in influenza relates almost entirely to its value in mitigating the virulence of the attack, and diminishing the risks of death. No definite evidence, unfortunately, can be offered as to its value in preventing attacks of influenza.

In order to throw light upon the question as to whether inoculation with influenza vaccine had any effect in increasing the susceptibility of recently-inoculated persons to infection, an investigation was made into the date of inoculation of 752 members of hospital staffs (doctors, nurses and wardsmen) who had been inoculated and had subsequently contracted influenza. These members of hospital staffs were in the course of their duties constantly exposed to infection, and if their natural susceptibility had been increased by the inoculation a large proportion of them should have contracted infection within two or three days of inoculation. Of the total number given, the exact dates of last inoculation could not be ascertained in respect of sixty-eight. Of the remaining 684, two were attacked by influenza on the day after their last inoculation; six on the second day; seven on the third day; six on the fourth day; nine on the fifth day; seven on the sixth day; five on the seventh day; forty-two between the seventh and fourteenth day; fifty-eight between the fourteenth and twenty-first day; thirty-five between the twenty-first and twenty-eighth day; and the remainder, 507, were attacked more than twenty-eight days after their last inoculation. These facts appear to indicate in a rough, but emphatic, manner that the question of negative phase in influenza is not one which need be considered in discussing the desirability of carrying on an inoculation campaign.

A very good illustrative instance bearing upon the value of masking in influenza occurred in the practice of a Sydney physician—Dr. W. F. L. Litchfield. During the height of the first wave of the epidemic Dr. Litchfield was examining a patient suffering from influenza, when a slight displacement of the gauze mask he was wearing occurred, and he distinctly felt the patient's hot breath pass down between the mask and the side of the nose towards his mouth. The sensation was so distinct that the doctor described the occurrence half an hour later to a brother practitioner, and expressed a hope that he had not been infected. Thirty-three hours later he experienced a feeling of languor accompanied by a slight rawness of the throat. This was near bedtime. He went to bed and got up as usual next morning, but a few hours later (forty-eight hours from the time of having felt the patient's breath) he experienced muscular pains and a rising temperature and went to bed with an attack of influenza, which proved a very severe one. One of the doctor's daughters who had passed a portion of the evening with him and was with him when he first felt the sensation of rawness in the throat was herself attacked by influenza forty hours later.

INFLUENZA EPIDEMIC IN THE HUNTER RIVER COMBINED DISTRICTS.

By Robert Dick.

This district, like all other parts of the State, suffered from the epidemic of influenza. From what I have learnt, there had been a considerable number of cases of influenza in various parts of the State, including the Hunter District, in the spring of 1918, but no particular attention was paid to it. Having noted the serious and alarming mortality resulting from the disease in Great Britain and other parts of the world, as well as in the neighbouring islands of New Zealand towards the end of 1918, the health authorities of Australia must have recognized that it was merely a matter of time for the disease to make its appearance locally. Steps were taken to make virulent or pneumonic influenza a notifiable disease under the Public Health Act, and regulations were gazetted dealing with contacts. Widespread preventive inoculation of the inhabitants of the State with a mixed vaccine containing influenza bacilli, pneumococci and streptococci, &c., was carried out, and arrangements were made for equipping emergency hospitals, organizing relief committees, &c.

The first known case of pneumonic influenza in the Newcastle District in 1919 was a seaman from an inter-State boat, who was admitted on February 27, 1919, to the Newcastle Hospital with supposed enteric fever, and died there on March 2, 1919 (the post-mortem showed this man to have died of influenza). A number of the other patients as well as some of the staff employed in the same ward as this patient contracted the disease.

The disease showed itself in two waves, the crest of the first being felt during the period April 6 to 19, and the second more pronounced wave extended over the period May 25 to June 28. After this there was a very rapid decline and disappearance of the disease. The outlying mining town at Catherine Hill Bay was the last centre attacked. That town and one or two others in the Maitland mining district experienced only one wave of the epidemic, but during its prevalance a very high percentage of the populations of these towns were attacked.

Types of Disease.—The disease as manifested in the district and in the State generally did not differ in any respects from the types seen by me in England and amongst troops in France. One characteristic of this epidemic was the large number of patients who showed a peculiar bluish hue of face, lips and ears, and this was in no way associated with any respiratory disturbance.

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As a matter of fact, this condition was present in a very marked degree in many cases from the very onset of the attack, and nothing whatever was discoverable in the lungs or other parts of the respiratory apparatus to account for it. Generally speaking, children escaped with a light attack; adult males often did badly. This was probably often due to the fact that able-bodied men went on with their usual occupations whilst running high temperatures, and would not take to bed until they became extremely ill. Another class of case that did very badly was the pregnant female. Unfortunately, a large number of women in this condition lost their lives, and of the many infants who were prematurely born not many survived.

Of the total deaths 290 took place in hospitals, and 204 occurred amongst patients treated privately in their own houses.

Of the deaths which took place in the hospital, about 20 per cent. occurred within twenty-four hours of admission. Of the total deaths, 288 were males and 206 females.

Lessons to be learnt from the Epidemic.

There is much useful knowledge to be learnt in many ways from this epidemic of influenza. It was the first occasion, as far as I am aware, in which a regular campaign was devised and launched to deal with a threatened invasion of a disease like influenza. The methods adopted, beginning with maritime quarantine, preventive inoculation of the population, masking, closure of theatres, picture shows, and all similar places where crowds congregate, the control of train and other traffic, &c., these all failed to prevent the entrance of the disease into the State, and when once introduced they had practically no appreciable effect in limiting its spread. I think it will be judged that the enforcement of many of these restrictions had few compensating advantages. No one will deny that it is very unwise to frequent crowded places during the prevalence of any infectious disease, but to compulsorily prohibit any and every form of meeting and to restrict travel unnecessarily is a different matter.

As to the beneficial effects of widespread preventive inoculation there was no definite evidence to show that the disease attacked the inoculated in less ratio than the non-inoculated but as regards the severity of attack and fatality rate amongst the two classes, the results show that the inoculated suffered much less severely and furnished a much lower death-rate than the non-inoculated.

In order to control any disease the first essential is to be quite certain of its causative agent. In some instances it may be admitted that even without this discovery having been absolutely proved it is possible, by employing suitable methods to absolutely control the spread of some diseases, for example in the case of small-pox, though the causative organism of the disease has not so far been demonstrated, yet it has been proved beyond doubt that vaccination can and does prevent the disease. But in the case of influenza and a number of similar complaints in which the causative agent is still disputed there have been no methods devised so far which can be relied on to prevent them. It has been for many years held that the influenza bacillus was the causative agent of influenza, but if that were so one would expect that the practice of preventive inoculation which has produced such strikingly good results in the case of typhoid fever would in the case of influenza be followed by similar success. But the experience of this epidemic has not proved it, and considerable doubt has been raised as to whether after all this particular bacterium is the cause of the disease.

One serious effect resulting from the adoption of the restrictions above-mentioned was that the general public was led to regard the disease as a very fearsome thing, and the application of regulations dealing with contacts strengthened their belief in the matter, with the result that so soon as a number of people fell ill they were in very many instances left to do the best they could for themselves because of the fear which the neighbours had of themselves contracting the disease.

In some towns yellow flags and other symbols were displayed to warn the public from entering the invaded premises, and this was cruelly insisted on in some district where, unfortunately, the local authorities had made no efforts to provide proper help for the stricken inhabitants.

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REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR THE YEAR 1920.

By H. M. CRAKE, M.D., D.P.H.

Climatic Conditions.

The weather in 1920, though not presenting any marked departure from the average, differed in several respects from the previous year. The total rainfall, 63·77 in., was almost exactly the same as in 1919. Unlike 1919, however, there were four rainless months, January, April, November and December. The most marked difference, however, was the unusually heavy rainfall of 6·27 in. in March. This brought the rainfall during the first

quarter up to 7·75 in. April was practically dry, only 0·04 in. of rain being recorded. During May only 2·61 in. fell. Even with the onset of the rains in June only 5·13 in. fell, so that the rainfall for the second quarter, which usually has a heavy fall during the latter half of June, was only 7·78 in. In July, 14·47 in. were recorded, and in August, the wettest month of the year, the rainfall reached 18·66 in. These figures are below the average, and had it not been for usually heavy rain in September and October, there would have been a considerable defect in the total rainfall for the year.

The maximum temperature rose more gradually than usual, and instead of reaching its height in April, as usual, it was not till May that the maximum temperature of 96·8° F. was reached. The later rise was followed by a later fall, i.e., April, May and June were the three hottest months instead of March, April and May. The delayed onset of the rains affected both mean and minimum temperatures, both of which were unusually high in June. Maximum temperatures varied from 78·2° F. (January and December) to 96·8° F. (May). Minimum temperatures from 55° F. (December) to 81·2° F. (June). The mean daily range (the difference between the maximum and minimum temperature) was as high as 23·2° F. (December) in the cold weather, and as low as 8·9° F. (July) in the rains.

Vital Statistics.

Death-rates.

The total number of deaths registered during the year was 35,276, equivalent to a death-rate of 39·3 per thousand. This is a slight improvement compared with last year. Since influenza swept through the city in 1918, the death-rate has risen by 50 per cent. Other Presidency towns have recorded even higher death-rates than Calcutta.

It is some consolation to find that the rise in the death-rate during the last three years is not due to local conditions, but is apparently intimately connected with the great pandemic of influenza which swept round the world in 1918, and still recrudesces at intervals.

Variations in the Mortality from different Causes.

Small-pox.—A severe epidemic followed the pre-epidemic outbreak of 1919 and was responsible for 2,925 deaths.

Cholera.—The epidemic of cholera caused 2,302 deaths. Though much less acute than in 1919, when 3,688 deaths occurred, the outbreak was of considerable severity.

Plague.—No epidemic occurred in 1920, only fifty-three deaths being registered as due to plague.

Influenza.—A very marked drop in the number of deaths recorded as due to influenza occurred from 3,363 in 1919 to 1,655 in 1920.

The deaths from "respiratory diseases" and "other fevers," under both of which headings a certain amount of influenza was inevitably registered, also show a slight diminution, so that there is no doubt that the mortality from influenza was considerably less this year.

All classes of the community, whether living in slums which in Lord Curzon's famous phrase "skulk behind a fringe of palaces" or in the "palaces" of the first-class residential areas, suffered to a greater or less extent.

Death-rates amongst Males and Females.

Out of the grand total of 35,276 deaths registered in Calcutta, 20,579 were males and 14,697 females. To anyone unacquainted with the remarkable constitution of the population this would appear to indicate a very low rate of mortality amongst females. Actually the reverse is the case, owing to females forming only one-third of the population. The rate of mortality amongst females was over 50 per cent. higher than amongst males. As I have repeatedly pointed out, whilst many factors are concerned, in my opinion the most important cause of this appalling mortality amongst females is the retention of the purdah system in a large congested city. The attempt to secure privacy in the slums and gullies of a great city necessarily deprives the women of the zenana of fresh air.

A marked improvement has occurred in the general mortality rate amongst Hindus compared with 1919. The relatively low death-rate amongst Christians (non-Asiatics) is due to the fact that this includes the European and Anglo-Indian communities, a large proportion of whom live under good sanitary conditions. The European community in Calcutta comprises a large percentage of males in the prime of life, selected by medical examination. The women and children, relatively few in number, are more or less migratory, whilst the majority of the men retire between the age of 55 and 60 years.

Compared with 1919, one finds an all-round improvement, save amongst children 1-5 years of age. This was largely due to the small-pox epidemic.

The death-rate amongst females was 50·9 per thousand as compared with 53·7 per thousand in 1919.

The infantile mortality rates, calculated on the number of births registered, was 386·0 per thousand.

There has undoubtedly been a decided rise in the infantile mortality rate during the last three years.

Nearly one-third of the total infantile mortality occurred amongst babies a few hours or a few days old.

The chief causes of death at this early period are delibility at birth, premature birth, and tetanus neonatorum.

Premature births are in many cases the direct outcome of syphilis. The widespread prevalence of venereal disease is shown by the very large number of stillbirths which occur. Venereal diseases are easily preventable, particularly amongst males. Immediate disinfection after exposure to infection will in the great majority of cases prevent syphilis, gonorrhœa, &c. Surely it is the bounden duty of

the medical profession to make these facts as widely known as possible. The attempt will, I know, meet with great opposition, and it will be said that the profession is only encouraging vice. As even immediate disinfection is not an absolute preventive, it is only necessary to clearly explain this when advocating its use to meet this objection. In view of the enormous amount of preventable suffering and disease caused amongst innocent women and children by venereal disease, it is high time that a determined attempt to educate the public was made.

The higher infantile mortality rate amongst Mohammedans has always been a feature of the vital statistics of Calcutta. It is in Mohammedan bustees one encounters opposition to health visitors, refusal to send cases to hospital or call in medical aid, whilst cases of infectious diseases are frequently concealed to avoid preventive measures. Amongst the poorer classes, the purdah is observed much more strictly in Mohammedan houses, and the inmates, particularly the females, are intensely conservative and loath to abandon old custom and prejudices. The comparatively low rate amongst non-Asiatics, &c., is due to the fact that this section of the community includes European and Anglo-Indian, the majority of whom adopt a fairly high standard of living, readily seek medical aid when necessary, and are fully alive to the benefits of sanitary surroundings. The low rate amongst Indian Christians is difficult to account for, as many of them live under very insanitary conditions. As the general mortality rate amongst Indian Christians is much higher than amongst non-Asiatics and Anglo-Indians, it is rather surprising to find the infantile mortality rate identical.

I am afraid there has again been a serious defect in birth-rate registration. The only explanation I can offer is the dislocation of routine work caused by the vigorous vaccination campaign and the severe and widespread epidemic of small-pox.

Principal Causes of Death.

Plague.—The recrudescence of plague this year was extremely mild. Only fifty-three deaths were recorded as due to plague, and the disease never assumed an epidemic form.

Cholera.—A severe outbreak of cholera occurred and was responsible for 2,302 deaths. It is disappointing to find cholera so prevalent again after the remarkable drop in 1917, when only 866 deaths occurred.

Small-pox.—A severe and widespread epidemic of small-pox occurred, and was responsible for no fewer than 2,925 deaths. The disappointment of myself and my district officers at our failure to check the spread of the epidemic is naturally very great, as we organized an extensive vaccination campaign and pushed vaccination as it had never been pushed in Calcutta before.

Fevers.—Malaria, enteric and "other fevers" all combined caused 3,714 deaths, a slight drop compared with 1919.

Dysentery and Diarrhœa.—A marked drop in the mortality from these diseases is the satisfactory feature of this year's vital statistics.

Tuberculosis.—A further increase in the mortality from tuberculosis has occurred. When influenza first broke out, one of the inevitable results was a rise in the tuberculosis mortality rate.

Influenza.—A very satisfactory decline compared with 1919, when the mortality from the cause was almost exactly double.

Respiratory Diseases.—Unfortunately these diseases caused nearly as many deaths as in 1919. As the recrudescences of influenza become less and less severe, it is difficult to classify cases correctly.

Plague.—There were fifty-seven cases and fifty-three deaths during the year under report, the rate of mortality being 0·05 as against 0·37 per thousand in the year 1919. This is the lowest death-rate ever recorded in Calcutta.

It is worthy of note that not a single fatal case was recorded amongst Mohammedan females. This obviously suggests concealment of cases.

In 1918 the Health Committee considered whether the campaign against rats should not be revived, and recommended that an experiment be made with some suitable rat poison which would be harmless to children and domestic animals and at the same time deadly to rats, and that a campaign against rats in domestic houses be organized. We are still on the look-out for this ideal rat poison.

Cholera.

The number of deaths from cholera was 2,302. The epidemic was much less severe than that of 1919.

The seasonal prevalence of cholera in 1920 presented a marked departure from the normal. In fact, its behaviour was absolutely unprecedented in Calcutta as far as I am aware. The normal curve of cholera in Calcutta is a gradual rise, starting in the cold weather, usually November and December. This year, for some reason or other, the normal rise in the cold weather began as usual, but rapidly subsided, and it was not till February, when the number of deaths rose to 120, that the epidemic really started. The mortality rapidly increased to 291 in March. It then remained practically stationary for two months, and suddenly rose to 386, its maximum, in June. It then rapidly subsided, and the epidemic was over in August.

In all parts of the city the use of unfiltered water for domestic purposes, particularly during the hot weather, when the supply of filtered water (largely owing to the appalling amount that is wasted) is insufficient, is responsible for many cases of cholera. Contamination of foodstuffs by dust and flies is another important source of infection, as there are still thousands of service privies remaining in the city. Another source of infection, and one which is extremely difficult to trace, is the "carrier," particularly if engaged in handling foodstuffs. In view of the custom and prejudices of the people and the large number of cases treated at home without

any precautions against the spread of infection, it will, I am afraid, be many a long year before cholera is brought under control in Calcutta.

Age, Sex and Class Incidence.

Hindus suffered far more severely than Mohammedans: 3·3 per thousand amongst Hindus and only 1·1 per thousand amongst Mohammedans, i.e., Hindus suffered three times as severely as Mohammedans. Amongst Indian Christians, the incidence was very similar to that amongst Mohammedans, viz., 1·2 per thousand. Amongst non-Asiatics and Anglo-Indians it was only 0·36 per thousand. Males were more susceptible than females.

REPORT ON CASES OF SMALL-POX TREATED IN CAMPBELL HOSPITAL.

By Lieutenant-Colonel Leventon, I.M.S., Superintendent.

For some unexplained reason small-pox has afflicted Calcutta in epidemic form every fifth year. Some of our epidemiologists might study this phenomenon and explain its quinquennial incidence. A possible explanation might be that immunity conferred by vaccination lasts only four to five years, and the protection afforded by re-vaccinations, which during an epidemic are very freely carried out, peters out, leaving people susceptible that were protected three to four years ago; a number of children born during that lustrum will not be vaccinated, and here we have a medium in which the virulence of an infection may be exalted. Why vaccination should be looked upon with disfavour in non-epidemic years in inexplicable. I suppose it has something to do with the old adage. "When the de'il was well, the de'il a saint was he," and the importance of periodical re-vaccination hardly ever comes into discussion except when there is an epidemic threatening or actually prevailing. Just as it took a fearful and bloody war to convince public opinion that universal service was a necessary factor to national existence, so it will take a deadly outbreak of small-pox to convince some families of the absolute necessity of vaccination and re-vaccination. The pity of it is that innocent children, who have no power to protect themselves, are exposed to torture, disfigurement, and death by the slackness or perversity of their natural guardians. Re-vaccination is not compulsory by law, but vaccination is in certain areas. In epidemic times it becomes manifest how often the law is evaded and the excuses therefor, which would be considered silly and petulant were they not so pitiful; very often I have rated parents about their infants and children being left unprotected, and have been sorry afterwards, for the sight of their suffering offspring (and death even) has been sufficient punishment for their perversity. Another disturbing factor is the so-called homœopathic preventive treatment, which consists of "swallowing certain globules." I have not been able to elicit much information about this method; only recently it was brought prominently to my notice in a case where the parent was astonished when the disease was declared to be small-pox, as under the advice of his homœopathic medical man he had protected his child with the "globules." He contested the diagnosis, but it is a case of severe confluent small-pox with a tendency to hæmorrhagic symptoms! The parent is now a sadder and wiser man; and there may be serious developments from this case, hence I particularize it. Many such cases have occurred; they do not achieve prominence, since the parents are too ashamed to speak about it, and the pitiable condition of the sufferers overshadows all other considerations. The information elicited by my inquiries is that homœopathic practitioners vaccinate their own children and themselves, so I am at a loss to know why they should not advocate vaccination for others. I would be very glad to be corrected, but the case above referred to gave me a rude shock, and would partly explain how it is that people are lulled into false security.

Another cause contributing to a periodical outbreak is the sketchy and faulty way in which the very simple operation of vaccination is carried out. I have seen cases where vaccination has failed, for the operator took such antiseptic precautions that he actually sterilized his lymph. A carbolic dressing, the lymph blown on to an almost red-hot lancet, the seat of the operation swimming in tinct. iodi., the patient sitting in the sun "to let it dry" (It being glycerinated lymph, will not dry, and the sunlight will quickly sterilize it). A tube of lymph may be faulty or sterile, and in many cases insufficient insertions are made; all these factors contribute to faulty vaccination, and the pitiable story of "the child was vaccinated but did not take" is too frequent to be neglected.

The question, therefore, arises of the necessity of a thorough and sound vaccination campaign during the intermediate years; moral suasion, unless accompanied by a certain amount of penalty, is of very little avail, and unless re-vaccination is carried out as a general practice every four to five years, we may always expect to have a quinquennial epidemic. Recently a Japanese professor of medicine visited our hospital to see small-pox. He had not seen any case in his own country, for vaccination and re-vaccination are compulsory there. A feature of this outbreak is that quite a number of Europeans very recently arrived in Calcutta contracted the disease, they had not been protected since childhood, and some had only doubtful marks; a good and sound practice would be to direct or advise all newcomers to be re-vaccinated immediately on their arrival. You cannot get away from small-pox infection here. I have (personally) seen cases in trams, a post-office crowd around the money-order window and in the street, and patients come to hospital in taxis and tiffa gharries which try to evade cleansing and disinfection. This was a marked feature last year, and I felt it necessary to report same.

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A police order was issued, and I gave orders to my tindal that he was to be careful not to injure the gear or fittings, and I am glad to report that hackney-people and taxis now do not object to their vehicles being cleansed and disinfected. Crowds of passengers and railway trains are notable foci. A case occurred recently where a woman, travelling by train with her child, covered with small-pox, waited the whole day in the waiting-room and went back with the train, a very potential distributor. The Calcutta railway termini are now patrolled by trained observers and suspect cases are sent to hospital. But they often will not come into hospital, in which case the matter is reported to the health officer.

It is often not possible to trace cases; the giving of false names and addresses is not uncommon.

Under the law as it exists at present, coming to hospital is voluntary. I do not believe a tithe of the number affected comes to hospital; very many cases are treated at their homes (or rather, left untreated). The roof of the house is the favourite place; a short while ago we had thirty-two admissions on one day—it was a day of great storm and rain, and I concluded they were washed off their roof-retreats. The vast majority of cases coming to hospital are severe cases; mild, discrete and modified cases, which ought to form the bulk of an epidemic, are usually kept at home. There is some religious merit about small-pox; it is not feared as much as it ought to be, and amongst the Marwari community the cases are all treated at home. What isolation can be carried out is impossible to surmise, and the spread of infection impossible to be guarded against.

It may be necessary at no distant date to penalize those people who have gone through an attack of small-pox, whereby, by reason of their slackness or perversity, they have become a charge and a burden on the State, and the parents of children suffering from the disease should be cited before a magistrate for disciplinary measures.

During 1918 only 107 cases of small-pox were treated at the Campbell; of these fifty-one were cured, fifty died, and six absconded from hospital. During November of that year we actually had a short period of not a case of small-pox in the house.

1919 was a bad year. Early in the year the health officer issued warning notices, and made vaccination free in all the vaccination stations. Cases became more frequent; we were never without from a dozen to fifty or sixty cases in the house during the whole year; wherever possible vaccination was advocated, but in December the disease declared itself in true epidemic form. I addressed every doctor I knew, and a vigorous vaccination campaign resulted. A total of 810 admissions were recorded in 1919, of which 444 recovered, 321 died, and forty-five absconded from hospital (absconders generally took with them hospital clothing, blankets and sheets, and must have been grave disseminators of the disease). But 1920 (till March 28) has been a terrible time; 1,002 admissions and 350 deaths have been recorded (seven absconded). At the time of writing there are about 150 under treatment.

Our accommodation was soon taxed to its utmost; in December, 1919, we recorded 115 admissions; January, 1920, 342; February, 395; and till March 28, 365. Our holding capacity is nominally 164, but by re-arrangement and taking up the plague ward, we could house about 200. I turned the European non-paying ward into an Indian ward, and concentrated all Europeans and Anglo-Indians in the European paying block; this was to obtain more room for Indians and to facilitate nursing. Occasionally Indians were housed in the European paying block. It was soon seen that accommodation would be insufficient, so I suggested to Dr. Crake that a large shed roofed with corrugated iron be built on the small-pox compound lawn. This was done very rapidly, and a fine long house was built with sal posts, brick floor covered with 1 in. asphaltum and mat walls, and a wash-house and latrine (*pucca*). This held forty beds and was used for convalescent cases; it was cold at night, but that was met by issuing an extra ration of blankets. There was great competition in getting a "seat" in this ward. This increased our capacity to 240. Even this was insufficient. I therefore suggested to Dr. Crake to search out a "garden house" with a big compound not too far off, to which convalescent cases could be sent, i.e., those requiring no nursing and waiting only for their scabs to fall. I proposed to keep all "acute" cases at the Campbell and relieve the congestion by transferring convalescents to the "garden house," thus establishing a convalescent and segregation home at a very small upkeep cost. Dr. Crake agreed with me, and expressed the opinion that this convalescent home would be far preferable to opening another hospital elsewhere which, with its attendant cost for medical, nursing and menial staffs, would be far more expensive and less efficient. He engaged No. 37, Tangra Road, Entally, and built sheds to house convalescents. Our first batch of twenty went there on February 1, 1920, and since then a steady flow of convalescents were carried by the ambulances, and we were able to carry on without opening accessory hospitals elsewhere. The total accommodation available in the Tangra Home was approximately 100. This was not the only emergency accommodation available, for Dr. Crake has still the Surinam depot to fall back on.

In the matter of accommodation I have only to state that no case of small-pox was refused admission. I cannot say what would have happened if every case of small-pox in Calcutta would have come. I have no doubt that there were several thousands of cases in the city, but, as I previously remarked, only bad cases came to hospital and people of the fluctuating population. I learned that very many cases were treated in their own homes.

Nursing presented a great problem; the wretched patients simply cannot help themselves, or even feed themselves at all. I got as many nurses as I could under the scale permitted, and even overstepped the scale at times. We have been most remarkably free from the dreadful ophthalmic "accidents" which happen in a small-pox epidemic. Early in the epidemic I told off a nurse who was specially instructed and attended only to "eyes"; she had no other work, and I have no doubt saved many eyes.

Baths form a very important part of small-pox treatment; in fact, I consider it almost the most important.

With the enormous population in the small-pox compound a shortage of filtered water soon manifested itself; and pumping our tanks full was not possible as our reservoir could not be fed sufficiently. This was met by drawing in another ferrule from the Beliaghata side.

To the Surgeon-General we owe a great debt for his help and personal visit to the small-pox hospital. It had a great effect on patients, who greatly appreciate visits and inquiries.

I should not have been able to carry on at all without Rai Bahadur Dr. L. B. Ganguly and my deputy superintendent. I cannot say enough of their work and their conscientious disregard of self.

The medical officer, Dr. H. Chakravarti, L.M.S., worked day and night, with the greatest energy and devotion to duty He was also largely responsible for the organization and equipment of the hospital, and ran it splendidly. When it was closed, he submitted the fullest and most minutely accurate report on its working that I have ever received.

Measles.

The number of deaths from measles was 155, or 0·17 per thousand, as compared with 122 deaths, or 0·13 per thousand in 1919. As the case mortality is usually low there were probably a very considerable number of attacks, and the disease was prevalent in epidemic form. The epidemic began suddenly in January, when the mortality rose to twenty-seven. In February a further rise to thirty-seven deaths occurred. The mortality remained at this level during the whole of March. A marked decline to twenty-three deaths took place in April, and then the outbreak subsided as rapidly as it broke out.

Enteric.

The number of deaths recorded as due to enteric was 360, equivalent to a death-rate per thousand of 0·40. The enteric returns have been high for the last three years. In 1917 there were only 209 deaths recorded. Enteric was prevalent throughout the year.

Malaria.

The number of deaths recorded as due to malaria was 1,289. This is a slight increase compared with 1919.

The combined rate (malaria plus other fevers) for the city was 3·7.

Mr. Tirunarayana Iyengar remarks: "*Anopheles stephensi* (a virulent carrier of malaria) has been found by the author to be very prevalent in Calcutta, even in its densely populated areas. This species has been previously recorded from Calcutta by Stephens and Christophers as early as 1902. I also learn that some specimens were bred out of larvæ collected from an old tub by Dr. U. N. Brahmachari and identified as *A. stephensi* by Christophers. Up to now no one appears to have suspected the fact that this dangerous carrier of malaria is to be found breeding in large numbers throughout the city, and no doubt giving rise to a considerable amount of autochthonous malaria among the population."

Dysentery and Diarrhœa.

One of the few satisfactory features of the vital statistics for 1920 is the decline in the mortality from diarrhœal diseases. This year a marked drop has occurred, the number of deaths from diarrhœal diseases being 3,098, or 3·5 per thousand.

The decline is particularly marked in the case of puerperal diarrhœa. Whilst this is largely due to the fall in the birth-rate, it is, I think, partly attributable to the excellent work of the lady health visitors and their midwives.

Tuberculosis.

The number of deaths from tuberculosis was 2,120. As I have previously pointed out during the three years (1915-17) an extraordinary improvement in the tuberculosis returns occurred, the number of deaths falling from 2,137 in 1914 to 1,539 in 1917.

With the advent of influenza this highly satisfactory state of affairs came to an abrupt termination. In 1918 the mortality rose to 1,826, and remained at practically the same level in 1919, when 1,889 deaths were recorded. This year, as already noted, a further rise to 2,120 has occurred. An increase in the prevalence of tuberculosis has always followed epidemics of influenza. With a series of epidemics, particularly when associated with serious pulmonary complications, this is inevitable. The germs of tuberculosis are everywhere, particularly in a city with thousands of cases of tuberculosis, all like the rest of the community spitting promiscuously. Everybody receives a dose of infection, possibly repeated doses. With a chronic disease like tuberculosis, it will, I am afraid, be some time before the disappearance of influenza in epidemic form is reflected in the tuberculosis returns.

I now have to record the most striking figures in the whole of the vital statistics. *The death-rate from tuberculosis amongst females was 3·6 per thousand, or more than double than amongst males. Further, this excessive mortality occurs chiefly amongst young women.*

These figures are positively startling. For every boy that dies of tubercle six girls die. For every young man that dies of tubercle five young women die.

I am convinced that the chief cause of this appallingly high rate of mortality amongst females is the retention of the *purdah* system in the slums of a great city. It is difficult to secure absolute privacy in narrow streets and gullies without sacrificing light and air. In fact, the *purdah* system is responsible for many of the extremely insanitary buildings one finds. Even when a portion of the house is fairly lighted and airy the women's apartments are rarely located there. The zenana is almost invariably in the inner portion of the house, ill-lighted and ventilated, but effectually screened from observation.

Respiratory Diseases.

The number of deaths from respiratory diseases was 8,144, or 9·1 per thousand.

These diseases were most prevalent in January, February and December. From March to July the mortality declined, when it reached its minimum. It then rose to 8·2 per thousand in August, and after dropping slightly in September and October, suddenly rose to 9·7 in November.

Influenza.

It is satisfactory to be able to record a marked drop in the mortality from influenza. I have already called attention to the fact that many deaths from influenza were recorded as pneumonia and "other fevers." As I pointed out last year, this is inevitable where many cases are not seen by qualified medical men.

The third recrudescence of influenza suddenly broke out in July. This reached its maximum in November. At the end of 1919 a slight decline from 414 deaths in November to 298 in December occurred. In January, 1920, a further decline to 222 deaths occurred. In February a terminal rise to 292 deaths, or 3·9 per thousand occurred. This was the highest death-rate recorded during the year. A slight decline in March to 245 deaths was followed by a marked drop in April (107 deaths, or 1·4 per thousand). During May, June and July the mortality remained at a low level, varying from 0·53 to 0·83 per thousand. A slight rise in August to 1·2 per thousand indicated the commencement of the fourth recrudescence of influenza.

The mortality rose to 1·8 per thousand in September. It reached its maximum, 2·1 per thousand, in October, and then declined slightly to 1·8 per thousand in November and 1·7 per thousand in December.

As in the previous epidemics Hindus suffered far more severely than Mohammedans, the mortality rates being 2·1 per thousand and 1·4 per thousand respectively. The incidence amongst Indian Christians was 2·0 per thousand, i.e., almost as heavy as amongst the Hindus. Amongst non-Asiatics and Anglo-Indians it was only 0·50 per thousand. This is apparently due to increased recuperative power rather than relative immunity, as Europeans and Anglo-Indians were frequently attacked. The death-rates amongst males and females were almost identical. In the 1919 epidemic the mortality was higher amongst males, in spite of the fact that the death-rate from respiratory diseases was much higher amongst females. The incidence at different age-periods varies considerably. Infants and old people are most susceptible. For some inexplicable reason it was lower amongst old women.

Relief centres in charge of medical officers and sub-inspectors were kept open in all badly infected areas. Here mild cases were treated with tablets containing quinine, ammonia, sodium benzoate and thymol. A saturated watery solution of thymol was distributed for use as nasal douches, but it was difficult to induce people to use it regularly. Stock mixtures, expectorant, stimulant, &c., were also provided.

Another outbreak of epidemic dropsy occurred, and was responsible for 112 deaths.

The outbreak was practically limited to the first few months of the year. During the second half of the year, i.e., July-December, there were eighteen deaths registered.

The local variations were very striking.

Hindus suffered far more severely than any other section of the population.

The high death-rate amongst females, 0·25 per thousand, was more than four times that amongst males. The fact that the disease is confined to Bengalees suggests some foodstuff as a causative factor. Possibly particular consignments of rice, dal, or mustard seeds may be affected by some fungoid disease.

The intense local house infection, its spread through the agency of human beings, but not from man to man, its sudden appearance and disappearance, all support Belany's theory that infection is transmitted by the bed bug.

The number of deaths recorded as due to kala-azar is a considerable increase compared with last year. The increase is probably more apparent than real as more cases are coming into the city for special treatment.

Non-Asiatics and Anglo-Indians appear to be most susceptible. Males suffered more severely than females. Adult males in the prime of life appear to be particularly susceptible, contributing over 50 per cent. of the total deaths.

Sanitary Department.

There was no reduction of activity on the part of the sanitary officers in regard to sanitary improvements during the year. A review of a year's work based only on the number of notices issued and prosecutions instituted hardly conveys a correct idea of the number of improvements effected.

The total number of prosecutions instituted during the year was 5,488. The fines inflicted amounted to Rs. 74,641. Of this the amount of

fines imposed under Section 495 for selling or manufacturing articles of human food or drink unfit for human consumption was Rs. 24,496.

All the bakeries in the city were inspected and reported upon during the year, the total number dealt with being 236. The lighting and ventilation were bad, but only one bakery was found situated in objectionable surroundings. The number of bakeries improved during the year was twenty-six.

I repeat what I have stated previously that there is no denying the fact that the majority of the bakeries are in a very insanitary condition, and that no radical improvements can be effected until the bakeries are licensed,

All the grog shops in the city were inspected during the year. The principal defects were noted as well as the absence of general cleanliness. It is satisfactory to be able to report that, as a rule, the Superintendent of Excise withholds the renewal of licenses in regard to these shops until our requisitions have been complied with.

All the aerated water factories in the city were regularly inspected during the year under review, especially with regard to their general sanitary condition. The food inspectors examined the bottles, water supply, receptacles for storing water, syrups, &c., and sent samples in suspicious cases to the laboratory for analysis.

Prizes to *Goalas* for the best kept and managed dairies were distributed during the year. The General Committee, on the recommendation of the Sub-Committee appointed to consider the matter, awarded the following three prizes: The 1st prize of Rs. 400; the 2nd prize of Rs. 200; the 3rd prize of Rs. 150.

The provisions in the present Act are not adequate to deal with the registered markets satisfactorily, and we have asked for powers under the new Act to exercise more effective control over such markets.

There were no features of special interest in the work done in connection with food inspection during the year. The actual record of work done during the year compares favourably with the figures of the previous year. The total number of shops and godowns inspected by Dr. S. N. Ghose, the Special Food Inspector, during the year was 162. The total quantity of adulterated ghee seized and rendered unfit for human food was 27 mds. and 25 seers. The total amount of fines inflicted was Rs. 10,575.

The percentage of adulterated ghee is steadily declining, and there is no doubt that the quality of ghee sold in wholesale and big retail shops has much improved since the passing of the Calcutta Municipal (Amendment) Act.

The work done by the special assistant analyst yielded very valuable results. The investigations have been continued, and action is taken against people selling articles which do not come up to these standards.

The work of examining foodstuffs arriving at the Howrah Railway Station continued satisfactorily during the year.

No further progress was made during the year in connection with the scheme for a dairy firm with a city dairy prepared by Lt.-Col. J. Matson. The Corporation accepted the scheme in 1918, and requested Government to undertake early legislation with a view to grant them powers to carry out the scheme. It is a matter of regret that this has not yet been done, and the scheme has to be kept in abeyance pending amendment of the present Act.

A severe epidemic outbreak of small-pox occurred during the year, and the Vaccination Department worked at very high pressure. The previous year, 1919, was a true pre-epidemic year. In November, 1919, when it was clear that a severe epidemic was sure to occur in the following year, immediate steps were taken to start a vigorous vaccination campaign. I have fully described in my previous report the arrangements made in this connection as a precautionary measure. The total number of vaccinations (primary vaccinations and revaccinations) performed during the year was 222,092. This number was never reached before, even during the severe epidemic of 1915, and it constitutes a record for the department. I heartily thank the medical practitioners of the city who performed vaccinations free of charge at their dispensaries during the epidemic.

There were no prosecutions under the Vaccination Act, the obvious reason being that it was very easy to induce people to avail themselves of the protection afforded by vaccination during an epidemic period.

Nothing in the shape of a general anti-mosquito campaign has yet been attempted, as we have neither the powers not the staff to deal with the innumerable mosquito breeding places on private premises. The legal powers compelling the owners and occupiers to keep their premises free from mosquitoes will shortly be forthcoming under the Amended Municipal Act and the Port Sanitation Act. I do not think it is desirable to attempt any general anti-mosquito campaign on a large scale until the Port Sanitation Bill is passed into law and work started in the port area. All that has hitherto been done in this direction is the reduction of anopheline mosquitoes in four of the most malarial wards of the city.

Lady Health Visitors and Midwives.

There were four maternity centres at work during the year, and it is very satisfactory to report that they are rapidly growing in popularity and are doing excellent work. The following are the remarks of the General Committee in their review of the Administration Report for the year 1919-20:—

"The work of the maternity staff has been commendable, and the Committee would be glad to see a greater extension of this work and more rapid progress, more maternity units, and an increased staff of midwives. The work in the opinion of the Committee is of primary importance in a city where the infantile mortality is great."

Colonial Medical Reports.—No. 138.—Calcutta *(continued).*

Miss Ellis, a lady doctor, was permanently appointed health visitor to a new unit which has been in operation since December, 1920. In spite of the difficulty of starting work in a new unit with midwives unacquainted with the district, Miss Ellis made it a success. Her work for this new unit is very remarkable, and speaks volumes for her energy and organizing abilities. She resigned in May, and has gone to England for higher medical training. The severance of her connection with the Corporation is a matter of sincere regret to the Health Department.

The returns show that 2,736 women were delivered by the Corporation midwives with only twelve maternal deaths, or, in other words, there were about five maternal deaths due to childbirth in 1,000 deliveries. This is a remarkable record, specially in view of the fact that most of the cases were delivered on the *kutcha* floor of the bustee huts under the most appalling conditions. The allowance must be made for the fact that 110 difficult or complicated cases were removed to hospital. In most of these cases the Corporation midwives were called in after the ignorant indigenous *dhais* had done their worst and the cases had become septic. I am glad to report that the Health Special Committee have agreed that in serious labour cases where the patients refuse to go to hospital an expert obstetrician should be available, and the Corporation has approved of a proposal to call in an obstetrician in all such cases and pay a fee.

The infantile mortality rate during the first ten days compares favourably with the general mortality during the first week. A very large proportion of the infantile deaths within ten days occurred amongst prematurely born babies.

The results of the present system of keeping babies under observation for three months are very encouraging, and it is high time for the development of child welfare work. I have submitted a scheme for extending the maternity and child welfare work in Calcutta, providing for the care of babies delivered by our midwives till they are 2 years old, and for the supply of dried milk and warm clothing to infants in necessitous cases. The scheme has been approved with slight modification, and I hope it will materialize soon.

During the year the work in the laboratory consisted of regular weekly examinations of the water supply of the city, both chemical and bacteriological, chemical analysis of foodstuffs received from food inspectors, examination of pathological specimens received from medical officers of the Corporation as well as from private medical practitioners, special investigations in connection with outbreaks of infectious diseases, and some miscellaneous tests and analyses. The laboratory staff also had to devote considerable time in conducting food adulteration cases, particularly those relating to ghee in court.

One sample of filtered water from Pulta once a week, and one sample of unfiltered water near Pulta intake once a month, were analysed.

The amount of chlorine as dissolved chlorides varied between 0·5 and 7·0 parts per 100,000.

The principal ice factories in Calcutta were visited, and samples of ice and water from the storage tanks were taken and analysed.

It is apparent from the results that the water in the storage tanks of the various ice factories is inferior to ordinary tap water, both chemically and bacteriologically, but the ice water is much inferior to either.

During the year the total number of foodstuffs analysed was 3,611. The percentage of samples found adulterated was 16·3 compared with 16·2 in 1919, 23·6 in 1918 and 30·7 in 1917. It is, however, regrettable that 40·5 per cent. of the samples of milk, and 45 to 50 per cent. of the samples of invalid foods were found to be adulterated. The presence of pakra oil has not been detected in any of the samples of mustard oil analysed during the year.

One hundred and six samples of filtered water were examined for the presence of comma bacillus, but with negative results.

Special samples of foodstuffs, such as milk, cheese, cream, tinned foods, &c., were subjected to bacteriological examination particularly in connection with the incidence of infectious diseases.

Special Work Done at the Laboratory.

The officer in charge of the Military Supply Depot at Hastings received a large consignment of edible oils, chiefly tilseed oil and mustard oil for Indian troops from contractors, a considerable portion of which he suspected to be adulterated with Pakra oil, and he requested us to take necessary action in the matter. As Hastings was beyond the jurisdiction of the Calcutta Corporation, and as the oil was stored in a Government godown where it was not exposed for sale, we could not take any legal action against the contractors. But as the health of a considerable number of troops was concerned, we undertook a qualitative examination of the whole consignment, consisting of more than 12,000 tins. The examination began on February 16, 1920, and the entire analytical staff and almost all the food inspectors were drafted to this work. It lasted for more than a month, and a considerable quantity of reagents was supplied from the laboratory; altogether 738 tins were condemned as containing Pakra oil, and the officer in charge was requested to inform us as soon as the contractors came to take delivery of the condemned goods so as to enable us to seize them from the contractors' godowns. The contractors delayed for a considerable time until, by a remarkable coincidence, a big conflagration occurred in the Commissariat Depot, and the entire consignment of oil was destroyed.

An oil mill-owner was found selling mustard oil adulterated with Pakra oil, and a test case was instituted against him. The voucher described the oil as " Mixed oil," and had a footnote containing

the words "to be used for illuminating purposes." In its colour, smell, consistency and other physical characters the oil resembled mustard oil, and would not be taken for anything else; even a literate customer would unhesitatingly accept it as an edible oil, though it might have other uses. But that small footnote was sufficient to protect him from the clutches of the law, and he escaped unpunished.

The above two cases forcibly prove the utter helplessness of the present law to protect the public from such a dangerous adulterant as Pakra oil, which has been conclusively shown to produce serious gastro-intestinal disturbances. It is high time that something was done to amend the law.

Some experiments have been made regarding the composition of dahi, chhana and khoa both commercial and genuine. The genuine samples have been made in the laboratory from milk produced from cows milched in my presence. The results may be briefly summarized as follows:—

(*a*) The Indian preparation called dahi, which is only soured milk, and which is extensively used by Indians, is generally made from skimmed milk, though it is palmed off to the purchaser and paid for as if made from whole milk. On analysis of a number of pure samples, it has been found that the fat content of dahi is practically the same as that of the milk from which it is made. It is therefore only reasonable that the fat standard of milk should also be applied to dahi.

(*b*) The Indian preparation called chhana (curd of milk), which is very extensively used by Indians in the preparation of sweetmeats, has in several instances been found to be made from skimmed milk, though the purchaser is under the impression that it is made from whole milk. The result of analyses of certain genuine samples made in the laboratory shows the fat of chhana to vary from 12 to 23 per cent.

(*c*) The Indian preparation called khoa (which is only desiccated milk) has been found in several instances to be almost devoid of fat. Analyses of certain genuine samples made in the laboratory show the fat content of khoa to vary from 18 to 34 per cent.

A few prosecutions have been instituted in court on the result of the above experiments and convictions obtained.

There was an outbreak of cholera at the Continental Hotel in June. There were three cases, of which two died. The diagnosis of the fatal case was very doubtful. As regards the other fatal case, the patient used to take his food outside. Careful inquiries were made into the water supply, milk supply and sanitary arrangements of the place. Specimens of blood from some of the kitchen servants were examined for Widal reaction to comma bacillus, but with negative results. No imported case or carrier could be detected. The causation of the outbreak could not be ascertained.

There was another outbreak of cholera in the same month, where four cases occurred, of whom one died and three recovered.

The blood and stools of the cook were examined with a view to find if he was a carrier—the result was negative. There was a history of imperfectly cooked meat being partaken of by some of the members of the family. Ptomaine poisoning was most probably the cause.

At Lee Road two gentlemen lived, one of whom had an attack of cholera on April 30, 1920, was removed to Presidency General Hospital, and was discharged cured on May 21, 1920. The other was attacked on June 28, 1920, and was removed to hospital. He was also cured.

Specimens of blood from all the servants of both the gentlemen and also of the *goala* were subjected to the Widal test with negative results. The stools of some of the servants were also examined, but no "carriers" could be detected.

The blood of Mr. L. (one of the cholera patients) was examined and found to be positive in a dilution of 1 in 40. Though no comma bacilli could be separated from his stools, it was possible that he was a "carrier" and might account for the other case. Mr. L. has since died suddenly of some other disease.

Detection of a Typhoid "Carrier."—There was an explosive outbreak of enteric at a Girls' School at 6, Dehi Serampore Road, where twelve cases occurred amongst forty girls between the end of June and the middle of August, of which two died. A short history is given below:—

The school reopened after the holidays on June 15, 1920. The first case occurred about the end of June. Three other girls became ill about the middle of July, when they were all removed to hospital. Gradually other cases cropped up, and by the middle of August altogether twelve cases occurred. The first case died in hospital on August 10, 1920. The main symptoms were high temperature, ranging from 101° to 105° F., and severe headache, furred tongue, vomiting, and in some cases diarrhœa. The blood was examined, and Widal reaction to *Bacillus typhosus* was found to be strongly positive in a dilution of 1 in 100 in all the infected cases.

Careful inquiry was made into the previous history of all the girls and their blood was examined for Widal reaction. It was found that two of the girls, Prity and Santi, who were sisters, gave positive reactions, one in a dilution of 1 in 40, and the other in 1 in 100. The history showed that Prity was ill with continued fever and diarrhœa for about a week on her way home from school about the middle of April, and Santi had suffered from an attack of fever and diarrhœa for a week just before coming to school. The stools of these two girls were inoculated on Endo's medium, suspicious colonies from each were separated and tested with agglutinating serum. Positive reactions were obtained in each case. The separated colonies were then passed through different sugars. It was then found that in the case of Santi the agglutinating test was corroborated by the sugar reactions, but not in the case of Prity.

Strict instructions were then issued to isolate

these two girls as much as possible and not to allow them to handle food. All the inmates of the school, including the teachers, were inoculated with prophylactic doses of anti-typhoid vaccine brought out from the Pasteur Institute, Shillong. Unfortunately severe reactions took place in all the cases inoculated with the exception of Santi, the suspected carrier.

Fortunately there were no untoward results and the symptoms subsided within forty-eight hours. The matter was duly reported to the Director of the Institute.

The necessity for fixing a standard for ghee was urged in last year's report. The standard which the Corporation laboratory has adopted as a result of its long experience was challenged in the case of Corporation *vs.* Grande Venkata Rathnam, which came to a close at the beginning of the year. The Hon. Judges of the High Court said in their judgment "we are strongly of opinion that a statutory standard should be laid down raising a presumption, and cases of this kind should not be made to depend upon the evidence forthcoming in each case testing the value of the Corporation standard." Though the party was convicted on the merits of the case, the Corporation standard was not accepted. The result has been that the analyst is required to prove the standard in each individual case, which in many cases leads to the waste of a large amount of time and energy.

Further, a considerable quantity of ghee comes from the Madras Presidency, and the merchants dealing in Madras ghee always urge that as in Madras ghee is manufactured from a mixture of the milk of cows, buffaloes, sheep and goats in which cow's milk predominates, and as the breed of the animals, the climate, the food, &c., are different from what obtained in Behar, the United Provinces, Punjab or Gujrat, a standard lower than that of the United Provinces or the Punjab should be applied in these cases.

In the *Calcutta Gazette* of September 1, 1920, a draft Notification under the Bengal Food Adulteration Act appeared in which, among other articles of food, ghee has been defined, its normal contituents declared, and standards laid down. The figures suggested thorein are practically the same as those adopted by the Corporation laboratory. If those standards are adopted in Bengal there is no reason why they should not apply to Calcutta.

The various difficulties enumerated above may be solved by the Government fixing a statutory standard.

Colonial Medical Reports.—No. 139.—Bihar and Orissa.

NOTES ON THE ANNUAL RETURNS OF THE HOSPITALS AND DISPENSARIES IN BIHAR AND ORISSA FOR THE YEAR 1920.

By H. AUSTEN-SMITH, C.I.E., M.B., B.C., Colonel I.M.S.,

Inspector-General of Civil Hospitals, Bihar and Orissa.

The total number of hospitals and dispensaries open on December 31, 1919, was 428. During the year under report eight new local fund, two new private non-aided, and one railway dispensaries were established. Among the eight local fund dispensaries, one was opened in the Patna, Saran and Hazaribagh districts respectively, two in Shahabad, and three in Manbhum. This rate of increase is not satisfactory in view of the fact that the Government are now helping District Boards by giving three-fourths of the original cost, provided the District Board will find the annual recurring cost of maintenance. District Boards should, in view of the liberal concessions, do all they can to build more dispensaries in the more populated parts of their districts.

Medical aid in *rural areas* is a matter which is engaging very seriously the attention of the Government. I have gone very fully into the question, and have corresponded with the Chairmen of all District Boards. The consensus of opinion is that the establishment of dispensaries is the best way to meet the need. Travelling dispensaries are useful, but not at all times a success, and except in the parts where the people are educated the subsidized medical practitioners are not likely to succeed. All Chairmen of District Boards in the Orissa and Chota Nagpur Divisions say it has no chance of success among the aboriginal tribes. In some districts in Bihar the system is under trial, but the difficulty has been to get the doctors, and this difficulty will remain until the supply of the sub-assistant surgeon class is a good deal greater than it is at present. I should have thought the retired sub-assistant surgeon, who is still of active habits, would be the kind of doctor who would succeed, but they all flock to towns, and say they must be there for the education of children. In

conjunction with the chief engineer, Public Works Department (Roads and Buildings), I have drawn up what I consider to be a good selection of type plans for District Board dispensaries to suit all needs, and at varying costs, to meet the finances at the disposal of District Boards. They can now select the most suitable plan and build accordingly. In reports I get from civil surgeons they all put forward the urgent necessity of more medical aid in rural areas. Many sites have been selected for new dispensaries in the more populated areas, and it is the duty of District Boards, with the aid of Government, to establish them as quickly as it is possible.

The number of travelling dispensaries at work at the close of the year under report were twelve. These itinerant dispensaries are likely to be a success in certain parts of the Province, and their increase will be encouraged in suitable parts. The difficulty is to get the type of doctor to put in charge. They should be especially good sub-assistant surgeons.

A temporary Central Famine Hospital was opened from May 6, 1920, at Nimapara in Puri for rendering medical aid in the famine area. The hospital was provided with twenty-five beds for males and twenty-five for females, and it was placed in charge of the assistant surgeon. The total number of patients treated at this hospital from the date of opening till the end of the year under report was 335, of whom 83, or 24·78 per cent., died. The highest death-rate was from dysentery, viz., in ninety-seven cases treated, fifty-two died. The high death-rate was to be expected among the debilitated population. Three temporary sub-assistant surgeons were also deputed for famine duty in different famine centres in the scarcity areas in this district for rendering outdoor medical aid to the recipients of gratuitous relief. They treated 817 patients.

The year under review was much healthier than the previous one, the total death-rate among the general population being 30·9 per mille against 40·0 in 1919. The number of patients treated in hospitals and dispensaries in all classes for some of the more important diseases, e.g., malaria, small-pox, plague, tubercle of the lung, kala-azar and leprosy, however, showed an increase in 1920, a fact which, no doubt, indicates that the benefits of the treatment afforded in dispensaries are greatly appreciated by the people.

The total number of patients treated for malaria rose from 732,428 in 1919 to 755,423 in 1920. Deaths from fevers among the general population, however, declined from 970,655 to 762,063. The prevention of malaria is a matter of education of the people. If they could only be made to understand every householder would see that there were no breeding-places near his house, and would insist on the larger breeding-places being treated with kerosene oil. The problem is being dealt with as far as possible, but until the people will understand it is a difficult one.

Deaths from plague among the general population increased from 16,601 in 1919 to 19,108 in 1920, but there was a very satisfactory decrease in the number of deaths from cholera, viz., from 104,727 to 26,341.

Cholera is endemic in Orissa, and there is every year an outbreak at the time of the Dol Jatra and Rath Jatra festivals at Puri. 666 cases were admitted to the Puri Cholera Hospital, 441 pilgrims from outside, and 225 local cases, giving a death-rate of 44·74 per cent. Many of the cases were received in a moribund condition. What is required is a pure filtered water-supply, piped and delivered by taps, protected so that it cannot become infected. There will always be cholera as long as the present well supply exists. The danger is an Imperial one, for these pilgrims infected with cholera distribute the disease all over India. The water-supply of Puri therefore is a matter of great urgency. It is very hard to get the people to obtain protection by submitting to inoculation by the cholera vaccine. It is definitely a protection from about the tenth day after inoculation and lasts for some six months.

The number of cases treated for this affection increased from 5,369 with 129 deaths to 5,699 with 127 deaths. There is a good deal of tubercular disease of the lung in this Province. In many hospitals at headquarters cases are treated with intravenous injections of sodium morrhuate with very good results. Especially satisfactory results have been obtained by the civil surgeon of Ranchi in a large number of cases. Tubercular disease of the lung is very prevalent in Ranchi, and I find this generally so where large missions collect together numbers of children. Twenty-seven cases were also treated in the Patna General Hospital with 168 injections. The results were not found to be very satisfactory in the advanced cases, and this is to be expected. In the early stages the results were found to be in some cases very satisfactory. The problem of the best type and site of special wards for tubercular cases still faces us. I have found that it is no good building these wards in the corner of hospital compounds, and where this has been done the money is, so to speak, wasted. A special ward for tubercular disease should be either attached to the hospital by a covered way, or built on the roof of the existing hospital. The special ward built in the corner of the compound is looked on as a moribund ward, and no one will go near it. It is best therefore to have a suitable ward so situated that patients will go into it and get up-to-date treatment.

During the year under report small-pox was prevalent throughout the Province. Deaths from this affection among the general population rose to 23,001 in 1920. The dispensary attendance also increased from 973 with fifty-nine deaths to 1,532 with 120 deaths. Vaccinal conditions were recorded in 709 cases. Of these, ninety-four had distinct marks, 246 faint marks, 170 no marks, and 199 were unprotected.

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The number of cases treated for kala-azar was 8,520 in 1920 as compared with 5,281 in 1919. Kala-azar seems to run along the lines of the big rivers, and in this Province is prevalent in the Patna, Shahabad, Muzaffarpur, Darbhanga, and Bhagalpur districts. The treatment is a difficult one, needing a careful technique as regards preparation and an experienced doctor, and therefore it is better carried out in the larger hospitals. I hope by training sub-assistant surgeons we may enable the treatment to be carried out in rural areas as well.

Filariasis is another disease that is endemic in Orissa, and investigations are now being carried out at Puri to ascertain the most successful form of treatment.

No general survey of the amount of ankylostomiasis among the people of this Province has yet been ascertained, but from what I have seen in my tours of the Province I have no doubt that the infection is certainly well over 50 per cent. in the districts in Bihar. A survey has been made in Bengal, and the infection in districts bordering on this Province is about 60 per cent., and from the survey made in the United Provinces in the districts bordering on Bihar it has been ascertained that the infection there is as high as 80 per cent. or more. This infection causes a general diminution of the standard of health and energy among the infected, and consequently in the aggregate is a great economic loss to the Province. A rough estimate of the average loss of efficiency is about 20 per cent., apart from the deaths and sickness caused by the disease. We know, therefore, that hookworm disease is prevalent in this Province, although, as I have said, an accurate survey has not been made, and the question is: What can be done? How are we to ensure success in any definite measures we may take, and will the expense be commensurate with the possibility of success? To ensure success we must change the habits of the people and insist on the use of suitable latrines and the wearing of shoes. One measure we are taking is to see that all doctors in charge of dispensaries understand the technique of the essential treatment and have the necessary drugs. We must also as far as possible supply microscopes to all hospitals and dispensaries. The instrument need not be one of the most expensive ones, but one sufficiently powerful to show the ova of the *Ankylostoma duodenale*. I have discussed the question with the Sanitary Commissioner, and we suggest having a special staff to start the work of investigation and treatment in one subdivision in a highly infected part, and we estimate the cost of this alone to be at least half a lakh of rupees a year. Education of the people is necessary, and simple preventive measures should be taught in schools—that is, people should be taught the importance of these measures from childbood upwards.

There has been no definite outbreak of influenza during the year, but a certain number of scattered cases.

The number of patients treated for leprosy at hospitals and dispensaries increased from 2,315 in 1919 to 3,488 in 1920. In the eight leper asylums in the Province at work during the year under notice there were altogether 1,852 resident lepers in 1920, against 1,563 in the preceding year.

The case of the leper is actively engaging the attention of Government. The asylums are being where necessary extended, and a proposal is now under consideration to form a leper settlement, probably at Gaya, for the compulsorily segregated lepers, under the Act, in this Province. The settlement would be to some extent self-contained, the lepers doing the work of the settlement, keeping the gardens, doing cultivation, &c., and in this way having occupation. Lepers in asylums or settlements need occupation of a congenial kind in order to keep them contented and happy.

The total number of patients treated during the year under report for gonorrhœa, syphilis and other diseases of venereal origin was 62,639, of which 49,193 were males and 13,446 females.

The scheme for the improvement of maternity methods and for the welfare of women and children will shortly be commenced in Patna City under a trained nurse as the supervisor. She has gone through a course of training at the Delhi School. We hope that the scheme may be a success and thus be an incentive to other cities to adopt a similar one, but to make such a scheme a success the co-operation of the people is necessary. It is for their good, and they should welcome such a scheme, and the Committee of the Victoria Memorial Scholarship Fund have agreed to give the pay of the maternity supervisor for two years. It will be necessary for the Municipality in the future to finance this scheme, which is for the good of the people of the city, and it is to be hoped that they will do so.

The work of formation of the new Medical College at Patna is now being actively pushed forward. A medical college for this Province is an urgent necessity, owing to the fact that so few students can at present obtain the higher registrable qualifications at the Calcutta Medical College. The number of seats there for this Province is only eighteen, and for the last few years the numbers of qualified students seeking admission has been on an average forty to sixty. It will therefore be seen that many students from this Province are debarred at present from taking the higher qualifications. When this college is formed it will be necessary to build a medical school elsewhere, for you cannot teach in two standards at one institution, and it is proposed to place this new medical school between Laheria Serai and Darbhanga. The plans for this school are now under consideration.

Another proposal before Government is the question of starting post-graduate courses for assistant surgeons and sub-assistant surgeons. These courses we propose to substitute for the

present useless septennial and quinquennial grade examinations. There will be two such courses in the career of an assistant surgeon, one course about the seventh year of service, and one about the fourteeneth year. At the end of the course an examination will be held, and if the assistant surgeon passes a certificate will be granted and promotion given.

For sub-assistant surgeons the course proposed will be held at the Temple and Orissa Medical Schools and will be of three months' duration. The course will be held about the seventh and fourteenth years of service, and it will be necessary to obtain a certificate of having passed a satisfactory examination at the end of the course, and on the possession of this certificate promotion will depend. In this way it is hoped to keep assistant surgeons and sub-assistant surgeons well in touch with the latest advances of medical science and up to date in their work generally. I hope it may be possible for local Indian doctors in the employ of District Boards to take up these post-graduate courses as well, and it is most necessary that they should. It will be all to the advantage of District Boards if they do attend the courses and obtain the necessary certificate. I would advocate their promotion being dependent on the passing of satisfactory examinations at the conclusion of these courses.

The pay and prospects of both the assistant surgeon and sub-assistant surgeon grades have been improved, and it is my hope that we may have contented, hard-working and up-to-date services to carry on the medical work of this Province.

Colonial Medical Reports.—No. 140.—Jamaica.

ANNUAL REPORT OF THE CENTRAL BOARD OF HEALTH FOR JAMAICA FOR THE YEAR ENDED MARCH 31, 1920.

By M. C. SOLOMON,

Secretary, Central Board of Health.

THE year under review has been practically free from epidemic disease.

An outbreak of dysentery occurred on the borders of the parishes of St. Mary and St. Ann, but owing to prompt and energetic measures the disease did not assume large proportions.

A few mild cases of influenza occurred in Westmoreland.

The campaign in connection with hookworm was creditably pursued by the Rockefeller Foundation in the parish of Clarendon.

The Jamaica Hookworm Campaign is the agency through which the International Health Board of the Rockefeller Foundation co-operates with the Government of Jamaica in the control of hookworm disease and the prevention of diseases spread through pollution of the soil with human bowel material. Among such diseases are typhoid fever, dysentery and the diarrhœas. The object of this co-operation is to demonstrate the importance of the soil pollution diseases, and the necessity for their control, and especially to demonstrate practical methods for such control. The definite work of the campaign, conducted under the supervision of the Central Board of Health, is to educate the people as to the prevention of these soil pollution diseases, to examine for hookworm disease, and to give free treatment to those who are found to be infected. For this work selected areas are sanitated by the Central and Parochial Boards of Health in advance of the treatment campaign. This sanitation consists of the construction at each home of a latrine which will prevent soil pollution.

The staff of the Jamaica Hookworm Campaign consists of a medical officer, three clerks, four microscopists, ten dispensing "nurses," and two caretakers. The medical officer is provided with an automobile, and each nurse has a bicycle for travel. The method of work is to assign a district —a village or settlement from 500 to 700 people— to each nurse. Lectures are given by the medical officer, and handbills and circulars are distributed in advance of the treatment work.

The nurse goes from house to house marking each with a number, and records the name, age and sex of each inmate. A small tin container is left for each person, with instructions for the preparation of a specimen of bowel material for microscopical examination. These specimens are collected on the following day by the nurse. At the time of these first visits the nurse takes time to explain the details of hookworm disease and its prevention at each home. For this work he is supplied with an album of local photographs which show in detail the ways the disease is contracted, the effects on the patients, and the results following treatment. Visits are also made to each district by a microscopist, who takes his microscope from house to house and demonstrates the eggs and larvæ of the hookworm in order to emphasize the necessity of using a latrine.

The specimens collected by the nurse are brought

to the Central Office laboratory for examination. Each specimen is examined by at least two microscopists, and, in every case, the results of each assistant are verified.

Nurses are required to make daily reports and complete records are kept of each case. A Treatment Book is prepared by the clerks, and those who are found to be infected are visited by the medical officer and each patient prescribed for individually. The treatment is carried to the people in their homes, and is taken in the presence of the nurse to ensure correct results. A person is pronounced cured only after a specimen, submitted at least one week after treatment, is found by careful microscopical examination to be negative. After being cured the patient is given a certificate; such certificates also being given to those found not to have hookworm.

A complete census of the May Pen area showed a population of 2,935 people living in 629 homes. Of these 2,842, or 98·8 per cent., were examined for hookworm diseases. Of the persons examined, 1,552 were found to be infected, and first treatment was administered to 1,348. Microscopic re-examination showed that 1,053 of these were eventually cured. Thymol mixed with equal parts of sugar of milk was used exclusively in this area.

In the Vera area of about 30 square miles the census revealed a population of 5,016 people living in 1,641 homes. Of these 4,967 were examined, and 2,118 were found to be infected with the disease. Of the 2,118 infected, 1,962 received first treatment, and 1,777 were shown by microscopic re-examination to be cured.

The total number of persons treated and cured in both areas are 3,308 and 2,835 respectively.

The results of the Treatment Campaign have been very gratifying, especially in the Lionel Town and Race Course areas.

M. C. Solomon,
Secretary, Central Board of Health.

Report on the Sanitary Condition of the City and Parish of Kingston for the Year 1919.

There were 1,735 births registered for the year. Of these 867 were males and 868 females. The largest number of births, 546, were registered for the last quarter. 533 were legitimate and 1,202 illegitimate, or 69·8 per cent. illegitimate.

The birth-rate for the year was 29·6 per 1,000 of population as against 30·25 per 1,000 in 1918.

The illegitimate birth-rate for 1918 stood at 67·10 per cent. This year it is 69·8 per cent.

Deaths.—Total number registered 1,522. The births, therefore, exceeds the deaths by 213.

Infantile Mortality.

Three hundred and fifty-seven infants (i.e., children under 1 year) died during the year. Of these 268 were illegitimate children.

The rate of infant mortality is therefore 205 deaths out of every 1,000 registered births.

Of the 357 deaths, 172 occurred in infants three months and under, i.e., 48·17 per cent., or nearly half the deaths within the first three months of life.

I have no doubt that this heavy infantile mortality is in a large measure due to poverty, overcrowding and underfeeding. The stamina of the parents is reduced from insufficient and improper feeding, the mothers cannot produce breast milk in sufficient quantity, and it is well known that there is no satisfactory substitute for the mothers' milk in early life. Nearly all the digestive troubles begin with artificial feeding. This is a difficult problem and requires skilled handling, which the poor mothers are quite unable to satisfactorily perform; further, from having to go out to work, the baby is left in charge of some kind-hearted but untrained person. Unsuitable food is given and the digestive organs seriously impaired. Further, it must be obvious that overcrowding and neglect must increase the incidence of communicable diseaes, especially of the respiratory and digestive systems; hence bronchitis, whooping-cough, epidemic diarrhœa, typhoid fevers.

Enteric Fever Mortality.

The deaths registered as due to enteric fever during period under review numbered sixty-eight, giving a death-rate of 11·6 per 10,000 of estimated population. Case death-rate works out at 18·6 per 100 cases notified. Last year the figures stood at 25·13 per cent.

I have already expressed the opinion that the prevalence of enteric fever is largely due to the presence in large numbers of pit closets, and that an improvement in this respect may be expected to follow the comprehensive water-closeting of the city. There is no doubt that the retention of human excrement in these offensive pits is primitive and dangerous, and should be abolished as soon as possible and replaced by sanitary conveniences more in keeping with the times.

There is too much pulmonary tuberculosis in Kingston. It reveals an unsatisfactory state of affairs as regards social conditions. It has been estimated that 90 per cent. of people have at one time or other been infected; but most have had sufficient "resistance" to recover, the minority, however, have not sufficient of this "resistance."

The death-rate from tuberculosis is an index of the social conditions existing in a community.

An improvement in economic welfare would almost certainly bring about a diminished death-rate from tuberculosis; on the other hand, poverty brings about an increase in the death-rate. An increase in "real" wages has been shown to exercise a favourable influence on tubercle; whereas wars, hardships, economic distress, depressing nervous strain, increase the incidence of this disease, and in many ways cause deterioration of health with diminished vitality and loss of earning

capacity, at the same time reducing bodily resistance to disease and so increasing the death-rate.

Report on the Sanitary Condition of the City and Parish of Kingston.

The water supply is controlled and operated by the Kingston General Commissioners, and regular examination and reports are made by the Government chemist and the Government bacteriologist.

Latrine System.—A section of the city is supplied with a water-closet system, operated by the Kingston General Commissioners. For the rest of the city the deep pit closet is the sanitary convenience. There are a few places using the bucket system. An extension of the underground sewer system is absolutely necessary. This would automatically remove the nuisance of slop water being run on the streets.

Excrement is removed by night in carts and buried in pits at Kingston Pens under competent supervision. Payment has to be made to the Mayor and Council for a permit to do this work. An extension of the underground sewer system would do away with this unsatisfactory state of affairs by getting rid of the objectionable pit closet.

A large quantity of forming and weeding of channels in the districts was done, also bushing and cleaning gullies and filling holes therein.

On account of the general low rainfall and the prevalence of high winds the surfaces of the streets were much affected. These periodic recurrences and the increase of the motor traffic makes it imperative that water-bound roads should no longer be built.

There has been no epidemic of a serious nature during the year.

Influenza of a mild type was prevalent practically throughout the whole year.

Several cases of dysentery occurred in the September quarter.

Twenty-two cases of enteric fever were reported in October. They were not confined to any one district, but occurred all over the parish. No common source of infection could be discovered. Three cases of scarlet fever were reported in January, 1920.

The general sanitary condition of the town and villages in the Liguanea Plains are fair except in the villages adjacent to Kingston, which consists of a collection of small, badly-built, ill-ventilated houses of the meanest description. Some scheme for the proper housing of the poorer classes is badly required.

Water Supply.—Liguanea Plains by pipes from the Kingston General Commissioners. Small townships are served by standpipes. Some districts are without a water supply.

In consequence of a recurrence of the epidemic of Spanish influenza in the United States in January, 1920, the Board made complete arrangements to deal with the disease. Fortunately, we have had no return of this dreaded malady.

Hookworm disease is still very prevalent.

The extension of the activities of the Child Saving League and the establishment of a crèche in this parish would go a long way in diminishing the infantile mortality and death-rates.

Lewis A. Crooks,
M.O.H., St. Andrews

Sanitary Report for the Parish of Saint Thomas.

Prevalence of Sickness.—Apart from a few cases of colitis in certain districts owing to polluted water caused by the recent drought the health of the parish can be considered good.

Water Supply.—Morant Bay is supplied by a reservoir, from which the water is led by pipes distributed in the town. The water is good, but is inadequate to supply an increasing population, especially in the dry seasons. The outlying districts derive its water supply from river and springs, the majority of which is protected but liable to pollution. The question of a pipe supply for Fort Morant is now under consideration. There are no public tanks in the parish.

There has been no outbreak of infective diseases, but cases of typhoid fever are reported from time to time.

On account of two months of severe drought colitis, especially amongst children, was prevalent. Pulmonary tuberculosis is still on the increase, and can be more often traced to returned men from Cuba and Central America, where the disease was evidently contracted.

Venereal diseases are very common, Gonorrhœa and tertiary syphilis being the commonest forms met with.

F. A. Norton, *M.O.H.*

Port Antonio.

The health of the parish has been good during the past year. There has been mild epidemic of measles, whooping-cough and mumps. Of the notifiable diseases, fifty-four cases of enteric fever were reported. Effort has been made to discover the source of infection, but without success. The dangerous relationship of the pit closets and well water supply has been again brought to the attention of the Board.

The water supply of the several districts has been the same as previous years, that of Port Antonio being very short towards the end of the year.

Efforts are now being made to have latrines built to meet the requirements of the Hookworm Campaign.

Venereal disease is very prevalent, gonorrhœa being most so.

F. G. Grossett, *M.O.H.*

Colonial Medical Reports.—No. 140.—Jamaica *(continued)*.

PORT MARIA.

The health of the district was on the whole very satisfactory. Except for a small outbreak of enteric fever, the district enjoyed a year free from epidemic, and the different seasons were not attended by the prevalence of any particular disease. Even malaria did not show its usual seasonal incidence in the rainy months, and only 104 cases were admitted to hospital. I should like to recall the fact that seven years ago the number of admissions to hospital for this disease was over 600, and that the gradual reduction to this low figure bears eloquent testimony to the value of the sanitary improvements undertaken by the Local Board of Health, viz., the filling of Warner's Pond and other anti-malarial measures.

The relative mortality in different seasons is impossible to arrive at, but the general mortality rate was low.

Meteorological conditions played little or no part in the causation of disease, nor did they have much effect on the public health. As far as weather was concerned, the past year may be regarded as a normal one.

Infective Disease.—During the months of July and August there was a small outbreak of enteric fever. In all nine cases were notified. The outbreak was traced to an unrecognized case of fever in a little girl, whose mother was water carrier for the Atlantic Fruit Company's wharf. The manager and two others contracted the disease, and at least two more could be traced to this source. The mortality was low, however, the only death being the unfortunate little girl in question, who was admitted to hospital in a dying condition.

This outbreak illustrates the great need of the two sanitary improvements that I have always advocated in season and out of season for this thriving little township—the extension to it of the Port Maria water supply and the establishment of a proper latrine system.

Overcrowding exists and is becoming more marked in yardrooms and barracks, owing to the return of labourers in consequence of the return of shipping of fruit and the extension of cultivation of properties recently acquired by the Atlantic Fruit Company. Model dwellings are, however, being erected on some of the estates, which is a step in the right direction.

Venereal diseases are very prevalent and are certainly on the increase, especially syphilis. It is seen now more frequently in its primary and secondary stages. The disease appears also to be more virulent, and some very acute cases with high fever and early cerebral and spinal symptoms have come under my notice.

Four cases of pellagra were seen at the poor-house with one death.

G. I. LECESNE, *M.O.H.*

GAYLE.

Apart from epidemic of dysentery in August-September, 1919, there has been no alarming outbreak of sickness for the year. Malaria cases have been fewer than usual. Influenza and chest cases have been more prevalent than in past years; several pneumonia cases have occurred at intervals during the year; one or two cases of mild typhoid have occurred. On the whole the health of the district has been good.

Latrines.—System bad. Most places have a spot allocated for disposal of excreta. Some have latrines. Most of the latrines are surface. Accurate statistics as to number of varieties cannot be obtained owing to local difficulties. Nearly all latrines are accessible to birds and beasts. None are fly-proof.

W. I. ESCOFFERY, *M.O.H.*

HIGHGATE.

There is no marked variation in the prevalence of diseases in this district; cases of malaria occur all the time, aggravated to a certain extent during the wet seasons. Bronchial troubles occur probably more commonly during the months of January, February and March. Enteric troubles occur during the wet months and during the very hot months, due, I believe, to quality of water that has to be drunk, and as boiling of water is not practised, except among a few, the water often drunk would be considered by me unfit, but until a water supply is installed this can never be remedied.

There is no regular sanitary arrangements existing, except those installed by each individual according to his taste. Without a water supply there can be no sewerage system. Nature provides the sanitary arrangements here. The country being of an undulating nature drainage (natural) takes place easily, and no cesspool or swamps exist.

The water is obtained from streams of springs wherever available. Private tanks exist. The quantity except in times of severe drought is fair, and if a water supply was installed the quantity would be quite enough. Under existing conditions it is surprisingly good; the water is of the purest.

Gonorrhœa and gonorrhœal complications are very common. Syphilis, chiefly tertiary, to some extent.

E. G. OSBORNE NIXON.

ANNOTTO BAY.

There has been no undue prevalence of any particular disease. During the end of the summer there was the usual increase in the incidence of malarial fever.

The supply of water in all cases is unlimited. The water obtained from the spring on Fort George is quite pure and an excellent drinking water. The water rises from three separate spots all within a

chain of one another, and they flow a distance of a chain or more before entering the reservoir.

In the town of Annotto Bay the bucket system is in use. Buckets are collected twice a week, and clean ones put in their place. The used buckets are carried to the dumping ground, washed in a tank provided for the purpose, and rinsed in a solution of Jeyes.

At the hospital and all the public buildings the buckets are changed every night.

Overcrowding is universal. I am not aware of any attempts having been made to improve this unsatisfactory condition.

H. Joslen, *M.O.H.*

St. Ann's Bay.

With the exception of malaria it can hardly be said that any particular disease showed a marked seasonable prevalence.

Sanitation is vastly improved in the towns, but still remains a negligible quantity in the country districts.

The mortality during the period under review was very low when compared with that of the two previous years. The temperature was mild and equable, and there was no one period to which might be attributed a larger mortality.

In the meteorological conditions no special change was observed. There are also no instruments provided for such observations.

A. D. C. Rob.

Alexandria P.O.

There has been no undue prevalence of sickness during the whole year. A few cases of typhoid fever developed during February and March, but it has now practically disappeared.

The mortality rate has been about normal. The meteorological conditions have been good. There has been a drought since February; the effect on the public is left to be seen. The infective diseases were chiefly typhoid fever. The deaths have been one or two. Particular faulty sanitary conditions.

Overcrowding exists, but it is only apparent during the illness of several members of the family at the same time, then it is manifest.

Every visit of the M.O.H. and sanitary officers is used to instruct the people—parents and children—in sanitary matters. Visits to schools are chiefly used to instruct the children in sanitation.

Gonorrhœa and tertiary syphilis are the forms most frequently met with.

W. E. Wilson, *M.O.H.*

Falmouth.

There were less cases of malarial fever seen than in previous years. No epidemic disease occurred. A few cases of chicken-pox were seen between November, 1919, and February, 1920.

Water supply of town of Falmouth is by pipe system throughout the town—water obtained from the Martha Brae River,

No outbreak of infectious disease occurred during the year.

G. P. Campbell, *M.O.H.*

Duncan's Medical District.

There has been no unusual sickness during the year in question. The usual epidemic of ackee poisoning occurred at the close of the year, but only one or two districts were affected.

About 30 per cent. of houses have latrines. Of these 70 per cent. are surface variety. There are none with the bucket system. There are none fly-proof, except in a large secondary girl's school. Most are now protected against birds and beasts.

There has been no unusual mortality during the year.

F. A. G. Purchas.

Montego Bay.

During the winter and early spring months malaria was quite prevalent. Yaws cases were also common in many of the country places during the spring season.

Inflammatory diseases of the nose and throat were unusually common.

J. Hamilton Clarke.

Montego Bay.

There have been no epidemics in my divisions.

The establishment of a sewerage system, a lighting system (whether by acetylene or electricity), and up-to-date sanitary slaughter-house and, at the Public Hospital, a maternity ward and an isolation ward—all those, in conjunction with the already well-known charms of the place would render beautiful Montego Bay more attractive, more sanitary, and more beautiful.

The established custom here is for the inspectors of nuisances to directly send in their reports once monthly to the Local Board of Health (or the Parochial Board) and not to the medical officer of health, who is thus left in absolute ignorance unless he finds out for himself. The Board also requires a separate monthly report from the M.O.H. as if he were another inspector of nuisance. In other parishes, I understand that the M.O.H. is regarded as the head of his staff, and it is from him alone that the Local Board of Health received reports of the health conditions and the measures adopted by him and his staff for the preservation of the health of the community. There is another very interesting and peculiar fact to which I now direct the attention of the Central Board of Health. It is that the M.O.H. of any parish or division of a parish is not even permited to be a member of the Local Board of Health, the ostensible head of which he justly ought to be, since he is the only one among them who ought to know, and does

know, the principles of sanitary science and hygiene.

It is obvious that such a mode of working, as now obtains, would prove most calamitous in any serious epidemic, when the sanitary inspectors would in accordance with the usual custom rush to the Board with their reports anxiously awaiting instructions and guidance from folks who do not know that they do not know. The pit closets which were instituted in the country districts for preventing or lessening the spread of hookworm disease have failed because the majority of the country folks prefer to adhere to the ancient custom of depositing their excreta in the fields, road trenches, or any sheltered spot in response to Nature's urgent call, as is evinced in the catharsis occasioned by excessive ingestion of mangoes.

The prescribed trenching around each pit is soon obliterated, and no attempt being made to restore it water flows in freely; and in the clay lands these become receptacles for fluid fæcal matter, a perfect culture medium for pestilential flies and mosquitoes.

I am of the opinion that this peculiar method adopted for getting rid of the hookworm disease has not only proved abortive for good, but aids a lot in the increased propagation of typhoid, dysentery, gastro-enteritis, and a host of the other maladies more immediately deadly than the tardy ankylostomiasis.

The calibres of the water pipes are gradually being lessened by water-cake and, so far as I can gather, no satisfactory attempt has been made to secure a full supply of water for the town, naturally the water supply is ever lessening, rain or no rain. There are no proper filter beds or other arrangements for softening or protecting from pollution vide the upper reaches of Retirement when, in rainy weather, the washings of cattle pastures and yards of settlers augment the streams to the reservoir no attempt having been made to prevent this by catch water drains or otherwise. In the reservoir at Brandon Hill there are many undesirable living beings, while the unfortunate Montegonians drink the spawns of frogs and other objectionables, boiled or unboiled. The creek supply is a clear sparkling water, saturated with nitrates and other evidences of decomposing animal matter. I strongly recommended boiling, and had a notice to that effect hung on the rails of the creek head, but some poor unfortunate creature tore it off.

Syphilis in its tertiary stage is still to be noticed. I have injected many cases for yaws with kharsivan with good results.

There has been a marked increase of deaths from pulmonary tuberculosis, and I have noticed that the majority of these were healthy people till the malignant influenza came, through which they struggled, however, but with vitality so lowered and resistance so feeble as to become the easy prey of the insidious bacilli of the white plague, when recuperation failed from lack of proper nutriment, fresh air and light. I have seen a few cases of sporadic cerebrospinal meningitis, attributed to the ingestion of ackees.

The honeycomb rocks on the outskirts of Montego Bay and in the pockets of the gully courses are the breeding places for anopheles mosquitoes. I have encouraged the deposition of street sweepings of the town over those honeycomb rocks facing the Public Hospital with the hope of filling up the water holes, and ridding the neighbourhood of the pestilential mosquito and blackwater fever. I now suggest that a sand-pump be established on the beach at White Sands to fill up the rock holes on the adjacent hillsides.

A. A. Vernon, *M.O.H.*

Savanna-la-Mar.

Malaria quite prevalent in other years between April and August was comparatively absent owing to the drought.

Ailments of the upper respiratory tract, on the other hand, were much in evidence due to the same cause.

This latter points to the necessity of constructing the roads with such materials as will produce a minimum of dust. The dust nuisance was and still continues a problem.

The water supply of the districts is derived from streams passing through them; they are quite unprotected and so liable to pollution. Available quantity varies with the season. Savanna-la-Mar derives its water supply from the Carawina River, six miles away, by pipes. The bacteriological examination from time to time show the necessity of boiling before drinking. The natural position and dry walls built around afford protection.

A. A. Anderson.

Lambs River.

There is no strict line of demarcation as far as disease is concerned in the different seasons. During the damp and wet seasons malaria is plentiful.

Water supply is from rivers, tanks, ponds and private containers. Quantity ample, liable to pollution and protected in a few cases.

There has been no increase or decrease of mortality in special seasons. Meteorological conditions do not appear to have affected the public health of my district.

There were no outbreaks of infective disease.

Noel Sandford.

Mandeville.

During the month of September, 1919, there was an outbreak of influenza which lasted for sixteen days. The appearance of the disease was very sudden and was confined to six neighbouring houses. Thirty persons suffered, but with no fatal result.

Bacillary dysentery assumed epidemic proportions during the months of October and November, and caused serious suffering among the people with many fatal cases. The origin of the trouble was no doubt caused by the use of bad water and its spread aided by the agency of flies. Sanitary conveniences being few in the districts, and whenever seen were situated on the slopes, thus allowing the ponds below the surface of the ground to receive their washings after the rains.

Cases of enteric fever occurred in seventeen districts, and from its distribution it was almost impossible to trace its origin in many instances. In two adjoining houses where there were eight cases one was able to track the infection to a person who had recently been discharged from a hospita where she had been under treatment for enteric fever and was admitted into these houses as a help. A similar occurrence was observed in another district with five cases. Three persons contracted the disease outside the parish and three from the use of a highly infected tank water. The remaining cases could not be traced as all information was withheld. The mortality rate was unusually high on account of the severe type of lung complications.

Cases of enteric will always occur in the parish, as fæcal matter outside the principal town is deposited broadcast in the fields, which is washed into the drinking ponds below the surface. The agency of flies as a possible means, especially during the mango season when these insects are a nuisance, must not be overlooked.

This town is in a fairly good sanitary condition, and the water carriage system where established has worked well; but I am sorry to report that the bucket system has not been satisfactory on account of the scavenger difficulty. These persons will empty the buckets at the first convenient place and not in the holes prepared for the purpose, thus creating fresh nuisances and the cost and difficulty in getting buckets.

Christiana.

Although this township is cleaner and the storm water carried off by covered and open drains, the surface latrine system is still a menace to the health of the community. The contents of the latrines are washed into the springs from which the water supply of the district is derived, but it seems by long habitude that the system becomes tolerant to the use of highly polluted water with no apparent bad effects, and I suppose it is for this reason that gastro-intestinal trouble is not more prevalent in this and other districts.

Porus.

This town is a low-lying one and difficult to be drained, hence the storm water is not easily carried off, and during the wet seasons the shallow ponds are formed which serve as breeding places for mosquitoes and the surface latrines become swamps of filth.

The parish of Manchester depends on rain water for its supply, which is collected from roofs, barbacues and the ground in tanks and ponds, and as nearly all these catchments are not protected from birds and animals, pollution to some extent is never absent from these tanks and ponds.

The public tanks with the catchment area above ground are protected against animals and therefore not liable to any serious pollution.

The reservoirs at Battersea and Porus are a supplementary supply of 800,000 gallons of good drinking water to the private-owned tanks in these towns, but a town the size of Mandeville with a permanent population of 869 persons, and with a daily average of over 100 visitors in residence since December, 1919, must require more than 680,000 gallons of water to meet its requirements.

In many districts there is no public water supply, and great hardship is experienced by the people in the long journeys for water.

The different seasons and meteorological conditions did not seem to influence the mortality rate, but superstitious practices were responsible for many deaths.

Pulmonary Tuberculosis.—This disease is unfortunately on the increase in the parish, and its ravages are likely to continue as long as the people are living in wretchedly overcrowded and badly ventilated houses and the calm fatalism with which the disease is regarded.

Venereal Diseases.—Syphilis is assuming serious proportions in the parish, and if the treatment of this disease is not undertaken in a systematic and intelligent manner the health and virility of people will be irreparably damaged.

Gonorrhœa with its complications is responsible for much suffering and invalidism, and there was a great wave of this trouble during the year.

M. M. Meikle, *M.O.H.*

Old Harbour.

The health of the community has been fairly good throughout the year, although during the months of November and December, especially the former, there were quite a few cases of influenza to be seen. Fortunately they were of a very mild type, quite amenable to treatment and without any ensuing sequelæ.

Malaria fever claimed many sufferers, especially after rains; these also yielded to treatment.

Yaws cases are plentiful, and every effort has been made to stamp it out. The cases treated have been very successful, but there is much to be done yet. It would appear that, in spite of the success attending the treatment, there are many people who still endeavour to hide away or are very tardy in coming out. There are not many cases to be found in the low-lying localities, but very plentiful in the mountainous regions.

Sanitary conditions are fairly good.

Arnold T. Clarke.

Colonial Medical Reports.—No. 140.—Jamaica (*continued*).

SPANISH TOWN.

During the autumn and winter months malarial fever prevailed to an abnormal extent. I personally investigated the cause of the increase and found it to be due to the swamping of cane lands, which caused the water to settle in various places, thus becoming the breeding place for mosquitoes. Not being able to use mosquito oil over so wide an area I have advised the residents to provide themselves with mosquito nets, and to remain indoors between sunset and darkness and so lessen the number of cases of malaria.

Spanish Town is supplied with a house to house water supply with pipes, whereas the other villages have tanks, and some use the irrigation water for drinking and other purposes.

The close of the financial year saw the parish in a profound drought, the vegetation being parched and the dust intolerable.

There has been no outbreak of infective diseases, Yaws, like the poor, we will always have. Hookworm disease is very prevalent.

Malaria is rampant on the plains, especially towards the sea, where the water is brackish, thus enhancing the breeding of mosquitoes. These parts, finding such good pools as are afforded by the irrigation of the cane area, come over in swarms, carried by the south winds, and as a result life becomes unbearable and malarial fever increases.

STANLEY L. LUCAS, *M.O.H.*

Colonial Medical Reports.—No. 141.—Jamaica.

ANNUAL REPORT OF THE SUPERINTENDING MEDICAL OFFICER FOR JAMAICA FOR THE YEAR ENDED MARCH 31, 1920.

ISLAND MEDICAL OFFICE, KINGSTON.

Infective Disease.

Enteric Fever (*Typhoid and Paratyphoid*).—The total number of cases of this disease shows a considerable increase. This disease appeared to be more prevalent in urban than in rural districts.

Enteric fever is a communicable disease, and is therefore theoretically preventable; its prevention or suppression depends to a great extent upon improvement in sanitation and hygiene, both personal and communal, and the want of attention and control of these most important subjects are probably the weakest points in the existing machinery against disease in this country.

Malaria.—This disease was fairly prevalent throughout the year. One of the most important initial measures in the prevention or suppression of malaria is the education of the inhabitants of malarial districts in the mosquito malaria theory.

Evidence is distinctly in favour of the systematic employment of quinine as a prophylactic, but it can in no way be regarded as a substitution for the efforts to exterminate the malaria-carrying mosquito.

Yaws.—Yaws is neither hereditary nor congenital, but is highly contagious (simple skin contact does not suffice; a breach of surface is necessary for transference from an existing case). Salvarsan and its derivatives have a rapid and remarkable curative effect on every stage of the disease, and is now the recognized specific treatment.

The treatment of salvarsan, &c., has been in operation for some time, but what may be termed the intensive method of dealing with yaws with salvarsan derivatives was started in October, 1919, all D.M.O.s being instructed to treat every known case in their districts. The consensus of opinion amongst medical officers in districts where yaws has been endemic is that the disease is well under control and is due to the recognized value of the treatment.

Tuberculosis.—Judging from the returns from the Public General Hospitals there has been a decrease in the number of cases, but a slight increase in this disease is observed by D.M.O.s in their private practice.

The establishment of a hospital for the treatment of tuberculosis in which ex-members of the B.W.I.R. should have prior claim to admission is now under consideration by Government.

Ankylostomiasis or Hookworm Disease.—A résumé of the work of the International Health Board or Rockefeller Foundation by the Medical Director for Jamaica, Dr. B. E. Washburn, follows:—

The Jamaica Hookworm Campaign is the agency through which the International Health Board of the Rockefeller Foundation co-operates with the Government of Jamaica in the control of hookworm disease and the prevention of diseases spread through pollution of the soil with human bowel material. Among such diseases are typhoid fever, dysentery and diarrhœa. The object of this co-operation is to demonstrate the importance of the soil pollution diseases and the necessity for their control, and especially to demonstrate practical methods for such control. The definite work of the campaign, conducted under the supervision of

the Central Board of Health, is to educate the people as to the prevention of these soil pollution diseases, to examine for hookworm disease, and to give free treatment to those who are found to be infected. For this work selected areas are sanitated by the Central and Parochial Boards of Health in advance of the treatment campaign. This sanitation consists of the construction at each home of a latrine which will prevent soil pollution.

The staff of the Jamaica Hookworm Campaign consists of a medical officer, three clerks, four microscopists, ten dispensing "nurses," and two caretakers. The medical officer is provided with an automobile, and each nurse has a bicycle for travel. The method of work is to assign a district —a village or settlement from 500 to 700 people— to each nurse. Lectures are given by the medical officer, and handbills and circulars are distributed in advance of the treatment work.

The nurse goes from house to house, marking each with a number, and records the name, age and sex of each inmate. A small tin container is left for each person, with instructions for the preparation of a specimen of bowel material for microscopical examination. These specimens are collected on the following day by the nurse. At the time of these first visits the nurse takes time to explain the details of hookworm disease and its prevention at each home. For this work he is supplied with an album of local photographs which show in detail the ways the disease is contracted, the effects on the patients, and the results following treatment. Visits are also made to each district by a microscopist, who takes his microscope from house to house, and demonstrates the eggs and larvæ of the hookworm in order to emphasize the necessity of using a latrine.

The specimens collected by the nurse are brought to the Central Office laboratory for examination. Each specimen is examined by at least two microscopists, and, in every case, the results of each assistant are verified.

Nurses are required to make daily reports and complete records are kept of each case. A treatment book is prepared by the clerks, and those who are found to be infected are visited by the medical officer, and each patient prescribed for individually. The treatment is carried to the people in their homes, and is taken in the presence of the nurse to ensure correct results. A person is pronounced cured only after a specimen, submitted at least one week after treatment, is found by careful microscopical examination to be negative. After being cured the patient is given a certificate; such certificates also being given to those found not to have hookworm.

Up to the present time only about two-thirds of the full-sized staff has been employed, as the sanitary work has not progressed fast enough to justify the employment of the full number of assistants.

The expenses of the treatment campaign are shared jointly by the Government and the International Health Board. The Government provided drugs, part of the stationery, and the printing, while the Board pays the salaries and travelling expenses of the staff and office rents and contingencies, and also provides office furniture, equipment, scientific supplies, record books, report blanks and other printed matter.

A complete census of the May Pen area showed a population of 2,935 people living in 629 homes. Of these 2,842, or 98·8 per cent., were examined for hookworm diseases. Of the persons examined, 1,552 were found to be infected, and first treatment was administered to 1,346. Microscopic re-examination showed that 1,053 of these were eventually cured. Thymol mixed with equal parts of sugar or milk was used exclusively in this area.

In the Vere area of about thirty square miles the census revealed a population of 5,016 people living in 1,641 homes. Of these 4,967 were examined, and 2,118 were found to be infected with the disease. Of the 2,118 infected, 1,962 received first treatment, and 1,777 were shown by microscopic re-examination to be cured.

The total number of persons treated and cured in both areas are 3,303 and 2,835 respectively.

The results of the Treatment Campaign have been very gratifying, especially in the Lionel Town and Race Course areas.

Commenting on above, it cannot be too strongly emphasized the importance of having Government supervision and inspection of latrines maintained indefinitely in all districts covered by treatment campaigns. It is more than probable that unless this is done sanitary conditions will early revert to their original unsatisfactory state, and render re-infection inevitable. In the administration of curative medicine, the essentials of preventive medicine is too frequently lost sight of, and all this effort and money may be wasted without an organized routine system to prevent re-infection of the soil.

J. W. McLean,
Supt., Medical Department.

Kingston.

During 1919-1920 there was no special feature calling for comment. In fact, the year was an uneventful one as regards the medical aspect of the district, and stands in marked contrast with its predecessor.

When one takes into consideration the favourable location of the town, one naturally thinks that the sick rate should be negligible, but at a glance at the other side of the picture changes the outlook entirely. The gifts of Nature are not only neglected, but in some instances thwarted. It may in truth be said that

"Every prospect pleases and only man is vile."

The water supply is practically unlimited during the rainy seasons, but during times of drought difficulty is often felt in meeting the demands, particularly in view of the growth of the population.

The quality of the water is unexceptionable as to purity and potability. The efficient filtrations to which the water is subjected before delivery to the consumers makes it absolutely safe for drinking.

Overcrowding with its attendant evils, moral and physical, is a prominent social, economic defect in Kingston, particularly in some of the suburbs where the people live in highly insanitary conditions.

The subject of mosquito extermination is kept well in view. Larvæ are regularly traced out and destroyed. Small pools of water are filled up and broken vessels, &c., prevented from lying about. The larger swamps are kept oiled.

The mortality rate for 1919-20 was much lower than that of the previous year. The highest mortality was, as usual, during the colder months.

In glancing over the vital statistics of the city one cannot fail to be struck by the large number of deaths recorded from phthisis and enteric fever: 179 from phthisis and eighty-three from enteric fever, to which latter may seriously be added twenty-one deaths recorded under "fever undefined." Here we appear to have the results of insanitary conditions speaking in eloquent and emphatic terms. Written comment would seem to be unnecessary.

Venereal disease, in its various forms and manifestations, seems to maintain its hold on the community. Whether the Venereal Disease Law, when properly started, will effect improvements in this respect it is too early to prophesy, but this may be confidently said, that if any successful campaign is to be carried out against venereal disease the sick must get in touch with efficient medical treatment at the start, and the charlatan and temporizer must be effectually eliminated.

LAWSON GIFFORD, *D.M.O.*

PORT ANTONIO.

If malaria be left out, there was no special prevalence of any particular disease during the year.

There is nothing to add to the reports made in former years regarding the sanitary condition of the several villages in the district.

The year was unattended by any excessive mortality rate.

Some 1,272 persons were treated for yaws by the injection of one of the "salvarsan" preparations. The results were with few exceptions satisfactory.

Syphilis is not on the increase. 225 cases of gonorrhœa were treated in the hospital during the year. In my opinion gonorrhœa is on the increase.

C. A. MOSELEY, *D.M.O.*

ANNOTTO BAY.

There has been no undue prevalence of any particular disease.

Annotto Bay is the only town in this district which has a water supply. It is obtained from a spring which rises out of the ground on Fort George, about three and a half miles from town.

The water obtained from the spring on Fort George is quite pure and an excellent drinking water.

In the outlying villages the water supply is obtained from the rivers and streams which pass through them. The water obtained from these rivers and streams is open to every kind of pollution.

The sanitary carts make house to house visits and remove the refuse. The bucket system is in use in the town. Buckets are collected twice a week and clean ones put in their places.

Overcrowding is universal. In the country districts it is even worse than in the towns. A labourer or a settler will have a two-roomed hut which is already choked with furniture, trunks or produce, in which three, four or six people will shut themselves up at night, blocking up every means of ventilation.

Yaws is very prevalent, crab yaws especially so, and always will be so long as the people continue to run barefooted over the St. Mary's clay.

Syphilis is very prevalent and is accountable for large numbers of miscarriages. The disease is quite common among young people.

Gonorrhœa is even more prevalent than syphilis.

H. JOSLEN, *D.M.O.*

LIONEL TOWN HOSPITAL, ALLEY P.O.

There was no seasonal prevalence of any particular disease.

Water supplies are exceedingly unsatisfactory, particularly at Hayes, where there is only one public well, which is over 100 ft. deep, and from which water is drawn by a bucket and windlass.

Overcrowding exists to a very large extent.

The population is well protected against smallpox.

Syphilis exists, in all its forms, to an alarming extent. The primary stage is not seen unless it happens to be of unusual severity or accompanied by complications. The extent to which it prevails among the young adult population is most regrettable. I am of the opinion that the disease is increasing.

These remarks apply with equal force to gonorrhœa.

M. T. CASSIDY.

MONTEGO BAY.

Pneumonia was fairly common towards the end of 1919, and in one district there were some five deaths in the course of a day or two from bronchitis-pneumonia. As bronchitis was prevalent in the district at the time, medicine was sent for distribution by the police and had the desired effect, no more deaths occurring.

Osteo-arthritis is extraordinarily prevalent in the district.

The Montego Bay water supply has its source at Retirement, and though the quality is good, the quantity is totally inadequate for needs of the

town, and during the year the hospital and some private residences have been repeatedly without water even for drinking purposes.

Sanitation.—I have obtained the following figures from the M.O.H., and they show that the system in vogue is almost prehistoric: Septic tank systems, 100; bucket systems, 8; pit systems, remainder of town. Most of the pits I have seen have little or no protection from flies.

It is with difficulty that parents can be induced to bring out their children for vaccination. This is in my opinion due to ignorance of the subject, and such ignorance is by no means confined to the lower classes, and from what I have seen I have no doubt that a large proportion of the inhabitants have never been vaccinated.

D. Lawrence Tate, F.R.C.S.E.,
Acting D.M O.

Port Maria.

The health of the district was on the whole very satisfactory. The district enjoyed a year free from epidemics, and the different seasons were not attended by the prevalence of any particular disease.

Overcrowding exists and is becoming more marked, owing to the return of labourers in consequence of resumption of shipping and extension of cultivation on the properties recently acquired by the Atlantic Fruit Co.

Breeding places for mosquitoes will always exist after rains, but they have been reduced to the minimum by the filling of swamps, oiling, &c.

During the months of July and August there was a small outbreak of enteric fever. Nine cases were notified. The outbreak was traced to an unrecognized case of fever in a little girl, whose mother was water-carrier for the staff at the Atlantic Fruit Company's wharf. The manager and two others contracted the disease, and at least two more could be traced to this source. The mortality was low, however, the only death being the unfortunate little girl in question, who was admitted to hospital in a dying condition. This outbreak illustrates the great need of the two sanitary improvements that I have always advocated for this thriving little township, viz., the extension to it of the Port Maria water supply and the establishment of a proper latrine system.

Yaws is very prevalent, the localities where it is specially noted being around Islington and Oxford.

Ankylostomiasis is very prevalent, as was shown at a recent survey made by Dr. Connor of the Rockefeller Foundation. His results showed that fully 96 per cent. of the labouring classes are infected.

Syphilis.—This disease is very prevalent, and is certainly on the increase. It is seen now more frequently in its primary and secondary stages than formerly, e.g., of seventy-one cases, thirty-six were primary and secondary as against thirty-five tertiary and congenital. This is, no doubt, due to the recent propaganda, and to the common knowledge that an injection or "Jook," as it is termed, will bring about a rapid cure.

In this connection I may mention that I have been reliably informed that within the past year some 60 to 100 women were refused renewal of their licences in the brothels on the Canal Zone, and were deported in batches to their respective countries, the majority being Jamaicans. If this be true the increased number and virulence of the cases can readily be understood. Investigation with a view to confirmation seems to be necessary, and isolation and intensive treatment of future batches of these ladies of easy virtue should be carried out before they are let loose on an unsuspecting public.

Where the disease is so prevalent it is safe to assert that 75 per cent. of the interrupted pregnancies will be caused by it and that the infant death-rate will be high.

G. I. Lecesne, *D.M.O.*

Office of the Quarantine Board.

The year under review has been a most anxious one, quarantinable diseases having broken out in several of the neighbouring countries. The quarantine regulations have been severely tested, and it is gratifying to be able to say that not a single case of quarantinable diseases has occurred in the island, thus demonstrating their efficiency and proving their utility beyond doubt.

When my last report was submitted small-pox was still prevalent on the Isthmus of Panama. It was, however, then under control. The locality is now practically free from the disease.

Small-pox also made its appearance at Santa Marta and Carthagena in April, and at Baranquilla in May. There is frequent communication between those places and Jamaica, and this has much increased of late. The greatest vigilance has had to be exercised in regard to arrivals from those places to keep out infection. Measures taken to combat it do not appear to have met with much success.

Through the Regulations of the Board and the energy of the various quarantine officers in carrying them out, Jamaica has enjoyed immunity from the introduction of quarantinable diseases for years.

New Orleans has usually a few cases of small-pox, which in the latter part of January developed into a small epidemic, and at the end of the time of writing it still persists.

In August, 1919, one case of plague occurred at Liverpool and two on board a vessel on arrival at Avonmouth. The two cases on the vessel at Avonmouth are of special interest. The vessel left Alexandria, Egypt, for Montreal, Canada, then Avonmouth. The infection came on board at Alexandria, and it was not until near Avonmouth that the disease made its appearance in the human, although infected fleas must have been on board for nearly two months.

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On November 8, 1919, a serious outbreak of plague with a high rat infection was reported from New Orleans, and a vessel from there was alongside in Kingston at the time the outbreak was reported, and the fact that no infected rats got ashore is a tribute to the high efficiency of our rat-guarding system.

Infected rats are still being found at New Orleans, but the number is decreasing week by week.

One case of yellow fever was discovered at Panama on a vessel from Corintò.

In the early part of January of this year influenza again appeared in the United States, and was reported to be particularly severe in Chicago, while every precaution was taken to keep it out of Jamaica, it was not at all certain that we would be able to do so.

The disease appeared in Havana in the middle of January, 1920. In February it was reported at Limon, Costa Rico, and in March at Colon.

A few vessels arrived with cases of influenza on board, which were promptly placed in the quarantine station.

The disease has now practically died out in the several countries mentioned, and Jamaica has escaped infection.

Disinfection by cyanide gas is undoubtedly the most efficacious method, and has the great advantage that it does not destroy any class of cargo and is extremely rapid, the whole operation being completed in two to four hours.

It has, however, the disadvantage that, except in skilled hands, it is extremely dangerous, and on this account it has not been introduced to Jamaica. I hope skilled assistance may be available shortly when it can be put into operation here.

CHARLES DON, *Secretary.*

LUNATIC ASYLUM.

The total number of patients discharged were 227; of these 217 recovered their sanity, four were relieved, whilst one was discharged not improved.

Notwithstanding the recrudescence of pellagra within our wards and the perennial presence of dysenteric diarrhœas, the death-rate remained well within the average.

In view of the prevalence of pellagra and the ever-soaring prices of foodstuffs, of special interest are the following notes of a report on the treatment and prevention of the disease by Joseph Goldberger, Surgeon-in-Charge of the Pellagra Investigations, United States Public Health Service.

(*a*) The disease is essentially of dietary origin.

(*b*) It is dependent on some yet undetermined fault in a diet in which the animal or leguminous protein component is disproportionately small.

(*c*) No pellagra develops in those who consume a mixed, well-balanced and varied diet.

Since then the disease is due to faulty nutrition the value of an abundance of nutritious food becomes apparent. It is recommended that every patient should take at least ½ lb. of lean fresh meat a day in addition to milk, eggs and legumes.

The inmates of the asylum are nominally allowed 9 oz. of beef per week or 1⅞ oz. per day. This quantity is again materially reduced by beef-contractors, who seem to believe there is more nutriment in gristle and bone than in lean meat.

I think it was Thomas Hood who exclaimed:—

"Alas! that bread should be so dear, and flesh and blood so cheap."

Unless and until proper steps are taken to control this high-handed action of beef-contractors, pellagra, I affirm, will continue endemic in the Jamaica Lunatic Asylum.

D. J. WILLIAMS,
Medical Superintendent.

LEPERS' HOME.

Jamaica Leper Asylum,
Spanish Town.

The average stay in the home of those who died has been:—

Males, 5 years 9 months 15 days.

Females, 1 year 6 months 9 days.

The longest period any one inmate has stayed, 39 years 1 month.

The general conduct of the inmates has been satisfactory. A few cases on infraction of the rules were dealt with.

Occupation.—The male inmates keep the grounds clean, do lime washing, carpentry and shoe-making work, stuffing mattress cases, act as ward orderlies, teachers and porters. They also cultivate the farm (4 acres), which is divided into forty plots; I allot these to the inmates, for the purpose of cultivating such articles of food as may be useful to the institution, and these articles are purchased at the ruling contract prices.

The female inmates do all the laundry and sewing of the institution, act as ward orderlies, under nurses, cleaners, &c. The indoor and outdoor work of the inmates has been well maintained.

Treatment.—Every method of treatment advanced in the past for the "cure" of leprosy has had fair trial here, but with indifferent results, as it is difficult in the majority of cases to make the inmates appreciate the fact that for any good results to be expected the treatment must be persevered in for a length of time. Of the methods tried, in my opinion, antileprol (a purified form of chaulmoogra oil) has given the best results, in all cases showing an arrest of the disease.

It is now beyond doubt that tubercular leprosy is dangerous to the public, and during the ulcerative stages should be strictly isolated.

J. HUNTLY PECK,
Medical Attendant

Colonial Medical Reports.—No. 142.—Ceylon.

ABSTRACT OF REPORT OF THE PRINCIPAL CIVIL MEDICAL OFFICER AND INSPECTOR-GENERAL OF HOSPITALS FOR THE YEAR 1920.

By G. J. RUTHERFORD.

Principal Civil Medical Officer and Inspector-General of Hospitals.

Population.

The estimated population of Ceylon on December 31, 1920, inclusive of immigrant coolies (but exclusive of military and shipping), was 4,806,726 (of these, 7,428 were Europeans). This total is an increase of 49,130 on the previous year's estimate of population.

Public Health.

Vital Statistics.—163,720 births were registered, which is equivalent to a rate of 34·06 per 1,000 of the population per annum, as compared with 161,403 in the previous year, showing an increase of 2,317 births. The deaths registered in 1920 totalled 132,955, as compared with 168,323 (a decrease of 35,368 from the previous year), which is equivalent to 27·66 per 1,000. The total number of persons treated in the hospitals in 1920 was 151,969, of whom 13,570 died. The number for 1919 were 133,195 patients, of whom 12,637 died. At dispensaries 1,491,429 persons were treated, who paid 2,203,724 visits in 1920, as against 1.499.891 persons, who paid 2,254,162 visits in 1919.

Deaths due to preventable diseases, i.e., to diseases due to faulty sanitary conditions, overcrowding, soil infection, defective or infected water supplies, &c., amounted to over 12,000. This figure does not include infantile diarrhœa or infantile convulsions, though it is probable that a large number of deaths from infantile convulsions are due to malarial infection, and a large number of cases from infantile diarrhœa to improper dieting, defective sanitary surroundings, and neglect.

Infantile Mortality.—The infantile mortality in the thirty-three principal towns during the year was at the rate of 228 per 1,000. 12,384 deaths from infantile convulsions were registered during the year. During 1920 fifty-one midwives were trained at the De Soysa Lying-in Home, Colombo. The number so trained since September 1, 1909, has been 311. The large number trained during the year is due to the increased accommodation made available at this institution. Midwives have been appointed to Government hospitals in large centres to try and decrease the infant mortality. A committee has recently reported to Government on the question of child welfare.

Vital Statistics on Estates.—The mean birth-rate on estates was 47·1 per 1,000, and the death-rate 52·0. The principal causes of death on estates were:—

Pneumonia, debility, diarrhœa, dysentery, anchylostomiasis, infantile convulsions, phthisis, dropsy, anæmia, and other diseases.

Influenza was still prevalent in most districts in the island in 1920, but not to the same extent as in 1919, and much less so than in the great epidemic of 1918. The type of the disease was also milder. There were two periods in the year when it was not prevalent, July and August, and again in October and November. Its exact fatality is difficult to estimate, as in the death returns influenzal pneumonia is often not distinguished from ordinary pneumonia, which causes a considerable mortality every year.

Malaria was again very prevalent, there being 16,538 hospital admissions for this disease. The increased number of admissions was mainly in the Central, Northern, and Western Provinces; in Uva and the North-Central Provinces the admissions were fewer. A large number was treated at estate hospitals and dispensaries not under Government control. As pointed out in previous reports, the problem of malaria control is a very complicated one, and calls for much consideration before any extensive measures of control, necessarily very expensive, are adopted. The first step in investigation is to be taken by the appointment of an entomologist to make a study of the various anopheline mosquitoes concerned in the transmission of the disease.

Plague.—The total number of cases reported was 369 with 316 deaths, as against eighty-nine cases with eighty-three deaths in 1919. Of these, 316 cases with 209 deaths occurred in Colombo, a marked increase over the previous two years' figures. Fresh centres of infection occurred in parts of the town other than the endemic area near the harbour. The percentage of rats found to be infected was double that in 1919. The rice shortage led to the storage of greater quantities of other grains in places quite unprotected against rats.

Cholera.—Only 115 cases with seventy-eight deaths were reported, as against 628 cases with 469 deaths in 1919.

Small-pox.—In all 126 cases occurred. Of these, eighteen were ship cases, of whom three died. In the Colombo Municipality an outbreak occurred in August after the arrival from India of a Chetty, who was developing the disease, and who remained in concealment when the rash appeared. This case led to the infection of seventy others. A prose-

cution was entered against the offender and one other, and fines of Rs. 1,000 and Rs. 750, respectively, were ordered; more deterrent punishment might well have been awarded, as several patients died as a result of this wilful concealment. Previous to that outbreak two isolated cases occurred, due to infection also acquired in India. In the Provinces there were two cases in the North-Western and two in the Southern Province.

In the Infectious Diseases Hospital, Colombo, 104 of these cases were treated, with twenty-two deaths. The medical officer reports that five of these deaths occurred in children who had never been vaccinated, and fourteen in cases showing no evidence of primary vaccination, though they were said to have been vaccinated in childhood. These figures afford a striking proof of the necessity for re-vaccination at puberty.

Enteric Fever.—A larger number of cases of this disease were admitted to hospitals in 1920 than in 1919. The increase was especially noticeable in the Western and Southern Provinces. 319 cases were again admitted to the General Hospital, Colombo, from the Municipality and its environs. As pointed out before, the actual prevalence of the disease in the island is uncertain, as many cases undoubtedly occur which are not recognized or reported as such.

Dysentery.—This disease as judged from hospital admissions was even more prevalent in 1920 than in 1919, in which year the admissions were almost double those of 1918. As this disease is associated with soil infection leading to polluted water supplies, the gravity of increase apart from its fatality is serious. It was unduly prevalent in all Provinces, except the Province of Sabaragamuwa and the Northern Province. The food difficulties may have exaggerated the incidence of this disease.

Leprosy.—Twenty-nine patients were returned as "discharged"; of these, twenty-three absconded and six were allowed home isolation. Of the twenty-three absconders, nineteen were returned of their own accord, or were brought back by the police, whilst four were still at large at the end of the year.

In July a school was started with three leper patients as teachers, and there are 108 pupils, including men and boys, on the register.

At Kalmunai, in the Eastern Province, sixty-seven lepers were treated, of whom eleven were new cases admitted in 1920; there were nine deaths.

During the past year or so serious claims of a material advancement in the way of curative treatment by the use mainly of derivatives of chaulmoogra oil have been made, especially in Hawaii and in India. Endeavours to obtain these drugs for trial in Ceylon have not been successful so far, but are being continued. Prolonged experience will be needed before a reliable opinion as to their value can be arrived at.

Anchylostomiasis.—The following report received from Dr. W. P. Jacocks of the Rockefeller Foundation, who has been in charge of the direction of the Anchylostomiasis Campaign in 1920, show the progress and activity in that direction.

"During the year estate field campaigns were conducted wholly in the Central Province. With the exception of outlying estates in Dolosbage, Rangalla, and North Matale sections, all planting districts in this Province have had the benefit of campaigns. Province of Uva was completed at the end of 1919. The planting districts embraced in the work included Kandy District, Galaha, Hewaheta, Wattegama, Panwila, Madulkele, Elkaduwa, Ambegamuwa, Kotmale, Dolosbage, Lower Dikoya, Agrapatana, Pundaluoya, Ramboda, Nuwara Eliya, Uda Pussellawa, and Maturata. Villages surrounding the estate districts were also included in the proclaimed area and were treated, special attention being given to these villages in getting latrines installed and used. In addition to estate work, organized village work on the community plan was undertaken in the Minuwangoda-Henaratgoda-Veyangoda section in the Western Province. The personnel needed to conduct the field work consisted of three regular Field Directors for the entire year, one extra Director from September 1, one post-campaign Director from September 1, four Assistant Directors, and a subordinate staff numbering 84, of whom 64 were regularly employed. During the year 126,529 persons were treated, and 96,477 were cured; 290,732 doses of vermifuge were given. These figures represent a considerable yearly increase in the amount of work done, and are greater than those mentioned in any preceding year. This increase was due in a great measure to the larger force employed.

"*Village Work around Estates.*—An interesting and important feature of the work was shown in the continued effort made by Field Directors to secure the interest of villagers living near estates, both in the matter of treatment and in measures for prevention. Most of these villages were not sanitated, but, with the co-operation of Government, special lectures and special sanitary inspectors were sent to many of the villages to instruct the inhabitants in matters pertaining to the erection, use and maintenance of latrines. The sanitary inspectors were left in the villages till the end of the year, with instructions that they might remain longer if needed. For campaign reasons no special effort was made to continue treatment in these villages until cures were established by microscopic findings. Upon the whole, however, practically all of these people were given two treatments without subsequent microscopic examination. In the up-country districts there were very few villages, but all the bazaars were treated. Work of this character is considered most important by superintendents, who fear that villages, unsanitated and untreated, will increase the reinfection percentage of their own coolies; and while this fact has not yet been established satisfactorily, still the treating of villages around estates is most important, and answers the criticisms which have been made in this connection. In Dr. Willenberg's area

alone 1,559 latrines were erected in villages, twenty-three of the bucket type and 1,536 pit. Figures for the other areas were not furnished, but can be obtained from the Sanitary Department.

"*Difficulties encountered.*—The difficulties met with during the year which tended to interfere with the work were distinctly unlike those of 1919. It is true that the rice situation gave trouble in the beginning of the year, but this was soon relieved when large supplies of rice began to arrive from India. The continued high price of rice, however, made the cost of the work to estates somewhat higher than in previous years, and interfered with village work considerably.

"During the latter part of the year the market price of tea and rubber, staple estate products, fell to very low figures, and in some instances to less than the cost of production. This disaster reduced the earning power of estates, and made it necessary for them to curtail all possible expenditure. In doing the work it is customary to ask estates to contribute a certain amount of extra rice, tea, and other small items to facilitate the work of the campaign. In view of the depression, the estates claimed that they were no longer able to furnish this small sum of money for the extra tea and rice and the day's name. As a result the programme was much shortened on some estates and entirely abandoned on others. Fortunately this crisis did not make itself seriously felt until very late in the year, but the future seemed so uncertain that, with the advice of the Anchylostomiasis Committee, estate work was abandoned at the end of the year, and was not included in the programme for 1921.

"*Post-campaign Work.*—The post-campaign staff, which had been working some time in the Matale District, was withdrawn in May, and the dispensers were assigned temporarily to the regular campaigns pending a reorganization of working methods. Plans were made to undertake post-campaign work in the Dikoya area in September on lines corresponding in general to those of the regular campaigns. Unfortunately at that time the crisis in the tea market became acute, and it was deemed advisable not to undertake new estate work until financial matters become more settled. Consequently, while this staff was not used for post-campaign work, the organization is intact and ready to undertake such work when conditions become suitable.

"Post-campaign work is most important. Considered from the point of view of permanent results, it is just as important as the regular campaigns, and should be given special attention at the earliest possible moment. In doing post-campaign work, the main consideration, until sanitary conditions are well established and well enforced, should be the reduction of mass infection, rather than attempting to obtain cures. In planning this work, it was proposed to make short visits to estates every six months for a period of one and a half to two years, giving one treatment to old labourers and two treatments to labourers not previously treated. After that time yearly visits should be sufficient, if, in the meantime, proper attention had been given to controlling soil pollution, which would take care of chance reinfection and uncured cases.

"*Community Village Work.*—A most important phase of the work, from the point of view of extending our efforts to the permanent population of the Colony, was undertaken when the community village work was started in the Minuwangoda area in May, and extended to the Henaratgoda and Veyangoda areas late in August. During the past four years campaigns have been conducted wholly, generally speaking, on estates, and very little attention has been given to the village areas unless the villages adjoined estates. Hence no previous organized effort had been made to standardize a plan of campaign for villages which would be economical and efficient. The towns of Minuwangoda and Henaratgoda were especially favourable points for beginning such work. They are situated in the Western Province about twenty miles north-east of Colombo. In the matter of town planning and sanitary arrangements they have received special attention from the Government Agent of the Western Province, who extended every courtesy and assistance in furthering the work. The towns have broad, clean, and well-kept streets, roomy boutiques, and a large number of satisfactory latrines. The population is keen, and the attendances at schools, which are numerous, is good. Advance information indicated that if village campaigns could be conducted successfully in Ceylon, the logical place to begin was in and around Minuwangoda. The success which attended this work confirmed the prediction made. The campaign was received by the villagers with much enthusiasm. The general population attended treatment at dispensaries in large numbers. The school children were a well-organized group, and were treated at the schoolhouses with the aid and consent of schoolmasters and parents. It was early realized that the success of the work would depend in a large measure upon the amount of co-operation which was obtained at schools, and it is gratifying to state that the schoolmasters upon the whole gave almost universal and active support. One of the most effective propaganda agencies for the work is the word of mouth information carried by school children to their parents, and it is most desirable, from a humanitarian and economic point of view, to treat the disease while the patient is young. The relief given by the treatment prevents dwarfing of the mind and body, which so usually accompanies this disease. After the children had been treated at the schools, it was a regular thing for villagers to offer themselves for treatment in increasing numbers with each succeeding week. The interest of the villagers was due in part to the influence of the headmen and the schoolmasters, and in part to the demonstration of the efficacy of the treatment by curing many severe cases, who came early to the dispensaries, and who would have succumbed to the disease if treatment had not been provided.

Colonial Medical Reports.—No. 142.—Ceylon (*continued.*)

"It should be understood that village work in order to be successful must be preceded by a vigorous campaign of education, which should explain clearly the symptoms of the disease and the reasons for advising treatment. At the same time definite instructions should be given about prevention. The educational campaign should precede the organized work at least six months, if possible. The Minuwangoda work was begun gradually, but extended with rapidity after the procedure was well understood. The educational work should be confined to two main ideas. To persuade the villager to take treatment by imparting accurate information which will overcome any prejudice which he has gained through ignorance and through improper reports; and to make known to him the advantages of prevention. In May a post-campaign dispenser was placed in the Minuwangoda town, who was instructed to mingle with the people and make them acquainted with the work and instruct them how to co-operate. The medical side in the beginning was taken care of by the Government apothecary, who was located in the town. Late in August it was deemed advisable to extend the scope of the work. Two additional dispensers were accordingly placed at Henaratgoda and Veyangoda respectively, and Dr. Clark H. Yeager was put in charge as Director. Dr. Yeager secured the co-operation of the people by obtaining the support of village headmen and village schoolmasters. The Government Agent, Western Province, circularized his headmen on the subject, instructing them to give every assistance, and the Mudaliyars and village headmen are to be commended for their hearty co-operation. The Director of Education circularized his headmasters, instructing them to offer every assistance in carrying out the treatment, and this was done very efficiently by them. The interest of local influential citizens was secured, and they were most helpful in explaining details to villagers who did not understand the purpose of the work, or who had been misinformed either ignorantly or advisedly by others. Lectures, illustrated by lantern slides or enlarged photographs, were given by the Director at schools and public gatherings whenever it was thought expedient. Much literature was distributed also. As a result of these methods of procedure the work became very popular, and villagers, both young and old, offered themselves in large numbers for treatment at dispensary points and at schools. The figures follow:—

Number treated	9,192
Number cured	1,975
Number treatments given ...	17,649

"These figures, while small in comparison with what was usually done on estates, are very encouraging when one understands that there were only three dispensers at work, and that the area was not proclaimed. In noting the small percentage of cures it should be stated that low-country infections are usually more severe, and hence more difficult to cure. Since it has been shown scientifically and experimentally that 95 per cent. to 97 per cent. of the worms are removed by two treatments of oil of chenopodium, patients were advised that it was not necessary to persist in treatment until a microscopic negative finding was obtained, but to return after some months for another series of treatments. At the same time many lightly infected people who came for treatment did not return for the microscopic examination to see if a cure has been effected. Microscopic examinations revealed the fact that 95 per cent. to 99 per cent. of the ordinary villagers, old and young, are infected.

"Two outstanding facts should be mentioned in connection with this work:—

"(*a*) The curing of a large number of persons who otherwise would have undoubtedly succumbed to the disease. Many persons came for treatment who were too ill to walk, and had to be carried by parents or relatives. Some of the severest cases of the disease were to be seen at the various dispensary points.

"(*b*) Increased interest in sanitary arrangements at schools and in villages. Figures showing the number of latrines erected for the year 1920 for the towns of Henaratgoda, Veyangoda and Minuwangoda are appended herewith. Active attempts to increase the sanitation of the district began in September. Henaratgoda, 173; Veyangoda, 525; Minuwangoda, 488.

"With reference to Minuwangoda, it should be stated that the installation of latrines had been in progress for some time, and that a total of 4,289 latrines had been built up to the end of 1920. All these latrines, except 488, were erected prior to 1920. No definite figures are obtainable at the present time for the schools. A rather high percentage of schools had either inadequate sanitary arrangements, or no sanitary arrangements at all. As soon, however, as this condition of affairs was brought to the attention of the proper authorities, active measures to take care of this situation were immediately undertaken through the Medical Department and the Director of Education. The Medical and Sanitary Departments, the Education Department, and the Government Agent, Western Province, gave invaluable assistance in the matter of sanitation. The Medical Department allotted additional sanitary inspectors, who resided permanently in the districts, and who were directly responsible for the large increase in the number of latrines installed in the towns and villages. The Sanitary Department furnished also a special lecturer, who visited the districts and gave talks, illustrated by lantern slides, on the prevention of soil pollution. It is undoubtedly true that before the end of 1921 campaign work in villages will be quite as well established as methods for working on estates. After that period it will only be a question of time before all of the inhabitants of

Ceylon can have this important matter brought to their attention.

"*Sanitation.*—In the 1919 report it was stated that if the matter of sanitation could be viewed as a five-year period considerable advance would be noted. The advances would not be manifested entirely in the erection and use of latrines, but to a great extent in the education of all classes to the need of controlling soil pollution and its accompanying diseases. Considerable progress was made during the year looking towards securing better methods of sanitation in conjunction with anchylostomiasis work. It should be understood, however, that a great deal remains to be done in the way of controlling soil pollution both on the estates and in the villages, and in obtaining and holding the interest of responsible persons in this very important matter, before it could be said definitely or with accuracy that sanitation in connection with anchylostomiasis work was well in hand. Hopeful measures, however, for meeting the situation are enumerated as follows:—

"(*a*) The appointment of an additional Inspecting Medical Officer who worked in the Central Province, and the appointment of three additional Sanitary Inspectors who worked in conjunction with the Inspecting Medical Officer in visiting estates prior to the work and subsequently.

"(*b*) A Bill making soil pollution a nuisance has been presented to the Legislative Council, and will undoubtedly be enacted into law in due course.

"(*c*) Individual attempts by certain superintendents to put into operation a set of rules which were devised to assist them in controlling this matter.

"(*d*) The forwarding by the estate agents to their superintendents of a set of rules devised to assist them in controlling soil pollution, with instructions to put those rules into operation as early as possible.

"A distinct advance, looking towards the better utilization of the work, was made during 1920 when Government appointed an Inspecting Medical Officer to visit estates in advance of the anchylostomiasis campaigns, and advise superintendents as to the sanitary precautions they should take in order to obtain the greatest benefits from treatment campaigns. Inspections were made in the Central Province, and were continued throughout the year until the financial crisis appeared. Not all estates were visited, as there were too many to be reached by a single officer, but it is true that estates which he was able to visit benefited greatly thereby, and the returns to them were undoubtedly increased. It is gratifying to state that the entire sympathy of all concerned in this procedure was obtained. Unfortunately, however, simultaneously with the appointment of the additional Inspecting Medical Officer and the Sanitary Inspectors, the financial crisis in tea and rubber appeared, and all inspections on estates by medical officers was confined to the advising of sanitary improvements. As soon, however, as conditions justify the inspections will be undertaken again. The reports of the Inspecting Medical Officer reveal the fact, however, that much remains to be done on many of the estates in the matter of sanitation.

"It might be well to quote from the 1919 report as to the very important position which sanitation has in work of this character:—

"'The experience in Porto Rico again makes concrete proof that our policy is sound in not encouraging hookworm measures, unless soil sanitation has been carried out at least six months in advance, and unless arrangements have been made by Government for maintenance and inspection to see that latrines are properly used. Although Porto Rico has a population of approximately one million, and has already spent $347,000 on hookworm control, we found an infection rate of over 90 per cent. in 2,000 examinations at various test points among the rural population. Fully 80 per cent. of the houses have no latrines. The trouble is that all the money was spent on relief measures, and very little effective sanitation was accomplished.'

"A large investment has already been made by Government and by estates in this matter, and if the greatest benefits are to be obtained thereby, the ground which has already been covered by treatments should be held. Steps should be taken to see that the latrines are properly built, properly maintained, and properly used. While treatment campaigns will relieve the suffering and save the lives of a great many, still its benefits are only transient if proper attention is not given to prevention.

"*General.*—Anchylostomiasis operations have been in progress in Ceylon since 1916. The demonstration of methods which was undertaken has been completed for estate work, and the treatment of labourers and the taking of measures to prevent reinfection have, in addition to its humanitarian aspect, proved a sound business proposition for employers of labour. Under the circumstances, it is presumed that the work will be continued in the future, and as methods are well understood, outside aid should no longer be required. With the help of the estate dispenser superintendents should be able to conduct their own campaigns. Where an estate dispenser was not employed, a campaign dispenser could be made available upon request. Further assistance could be had from Government in the way of drugs and equipment. The central laboratory in Colombo could take care of all necessary microscopic examinations. General supervision of the work could be given by an administrative medical officer living in Colombo, in addition to his own duties. Such a procedure would be more economical, would interfere less with estate routine, and would represent work undertaken on a large scale and over a more extended area than could be attempted by organized campaigns working in restricted districts."

Commenting on the above report, it must be regretfully admitted that on some estates the latrine accommodation provided has been either

allowed to fall into disrepair, or is not used as carefully as should be the case. Soil pollution is still far too prevalent. The utmost vigilance of local authorities in towns and villages where latrines have been or are being constructed will need to be exercised to see that such latrines are maintained in good repair, kept clean, and properly utilized. As pointed out, treatment of the affected is very necessary, but prevention of fresh infection or re-infection is equally and indeed more important.

Parangi (frambœsia or yaws) is widespread throughout the island; the Northern Province is the least affected part. Apart form the hospital admissions, a large number of cases was treated at the various dispensaries in all Provinces.

The injection of salvarsan (and its homologues) results in a rapid improvement even with a single injection, and two or three injections usually suffice to effect a cure. Those drugs are expensive, and were very difficult to procure in quantity in 1920, but are now more freely available. The technique of the injections requires study and care, and increasing numbers of the medical officers of the Department are being trained in its use. From what has been said above, it will be seen that this loathsome disease is eminently curable, provided that trained medical officers can be brought into contact with the sufferers, and the additional expense entailed on a campaign against this disease ought to yield brilliant lasting results. It must not be forgotten that centres of infection are often isolated villages whose inhabitants have to be encouraged to permit of modern methods of treatment being adopted. However, the striking result of proper treatment should and does win many converts. The problem is to make such treatment available in isolated places. This can only be done by appointing itinerating medical officers.

Cancer and Sarcoma.—The number of cases of malignant disease treated in the various hospitals was 617 with seventy-six deaths. Unfortunately the disease is far advanced before many victims enter hospital, so that any hope of successful treatment is out of the question.

Tubercular Disease of the Lungs (Pulmonary Phthisis).—Apart from the cases of phthisis admitted to the General Hospital, there are three special institutions dealing with cases of this disease: The Anti-Tuberculosis Institute in Colombo, the Sanatorium for early cases at Kandana, and the hospital for advanced cases at Ragama.

Public attention has been drawn to the tuberculosis problem by lectures delivered at various places, viz., Moratuwa, Panadure, Kalutara, Negombo, and Matale in English, and at Panadure, Matale, and Ambalangoda in Sinhalese.

At Kandana Sanatorium (48 Beds).—185 patients were admitted during the year 1920; of these, 100 were males and eighty-five females. Out of the 170 cases admitted from the Western Province, 127 were from within the Colombo Municipal limits. The number discharged was 168, fourteen were transferred to Ragama Hospital, and two died. Of the 185 admissions, 128 were classed as being in the first (early) stage of the disease, twenty-two in the second stage, and thirty-five were in the third stage. The average duration of stay in hospital was ninety-six days.

At the Ragama Hospital for Advanced Cases (159 Beds).—765 cases were admitted in 1920; the duration of stay of each case was sixty-nine days for males and eighty-six days for females. Of the admissions, 416 were residents of Colombo. This increased duration of stay this year was due to the fact that patients realized that a more prolonged stay was necessary for their own good. Additional beds were provided in 1920 to the extent of fifty beds, bringing up the total accommodation to 159 beds.

Port Health Precautions.—During the year 2,682 British and foreign steamers and 348 native sailing craft called at the port of Colombo and were medically inspected. Of these, twenty vessels were kept in strict quarantine until the sick were landed and disinfection performed. Eighteen vessels were found infected with small-pox, and nineteen patients were sent to the Infectious Diseases Hospital with that disease. One case of typhus fever was landed; infection contracted at Malta. One case of plague was landed from a Japanese vessel. One Maldivian sailing boat had three deaths on board from plague, the infection being contracted in Colombo. Cases of measles and chicken-pox were isolated on board.

Meteorological Conditions.

Rainfall.—Out of the 267 rain gauges that reported to the Colombo Observatory, the extreme figures for the year were from Watawala railway station with 257·98 in. in 203 wet days, and from Hambantota with 31·40 in. in 121 wet days. The longest drought occurred at Puvarasankulam, lasting for 157 days—May 4 to October 7. The longest wet period occurred at Holmwood estate, lasting 53 days—June 10 to August 1. June and November were the two months in which the rainfall was most noticeably above average, but examination of the annual totals show that this year there is no one phrase that summarizes them. The areas with more than their average rainfall include roughly the Northern Province, most of the North-Western Province, the western face of the hill country, and the low country west of it (i.e., parts but not the whole of Western Province, Central Province, and Province of Sabaragamuwa). Galle and Batticaloa were both above their average, but the greater number of stations in the Southern and Eastern Provinces were not, and both Uva and the North-Central Provinces can show offsets in both directions.

Temperatures.—The station showing the highest mean shade temperature for the year was Trincomalee with 83·7° F., and the lowest Nuwara Eliya

with 59·3° F. The figures for Colombo and Kandy were 80·5° F. and 76·2° F. respectively. The highest shade temperature recorded during the year was 98·5° F. at Trincomalee on June 23.

The Sanitary Branch of the Medical Department.

Infectious Diseases.—The following cases of infectious diseases were reported and prophylaxis carried out: Enteric, 932; dysentery, 305; chicken-pox, 888; measles, 708; small-pox, 29; plague, 14.

Cholera Epidemic at Karunkoditivu.—An epidemic of cholera broke out at Karunkoditivu and the neighbouring villages in the Eastern Province during December, 1919, which continued up to February, 1920, when a clean bill was declared. Fifty cases occurred during this epidemic, of which thirty-one died and nineteen recovered. A definite source of infection could not have been traced in this epidemic, as the original cases were not reported in time. The Assistant Sanitary Officer, however, reported that the evidence pointed to the fact that the disease had been introduced from Uva, where there was an epidemic during December, 1919. Two sources have been suspected, viz.:—

(1) Tissamaharama, through people who had gone there for paddy cultivation.

(2) Uva, through cattle traders who do not use the roads, but jungle paths.

One of the victims amongst the original cases was a Moorman who frequented Tissamaharama in connection with his business as a cattle trader. The epidemic was of the chain type, showing that the infection was acquired by contact, and not of the explosive type, due to infected water.

Epidemic of Enteric Fever at Hikkaduwa, Dodanduwa, and neighbouring Villages.—A serious epidemic of enteric fever broke out at Hikkaduwa, Dodanduwa, and the adjoining villages during March. There were no Sanitary Inspectors in this area, and the cases were not reported till the epidemic assumed serious proportions. With the rigid prophylactic measures adopted the epidemic began to abate rapidly during the latter part of the year. The disease was chiefly communicated by contact infection, and satisfactory home isolation was impracticable owing to the insanitary and crowded condition of the houses and the dirty habits of the people. The most successful preventive measure was anti-typhoid inoculation. Unfortunately it could only be carried out as a voluntary measure, and much persuasion was necessary to induce the people to be inoculated. Altogether 517 subjects were inoculated. The water supply in all the cases was inspected and disinfected, and all infected material was carefully attended to. Gardens were cleaned at Government expense, and disinfectants were distributed and used under the supervision of the inspectors.

Enteric Epidemic at Mount Lavinia and Dehiwala.—An outbreak of enteric occurred in Dehiwala and Mount Lavinia in May, and lasted during May, June and July. The source of infection was traced to Colombo. This outbreak was chiefly confined to the most thickly populated and insanitary quarters of Dehiwala and Mount Lavinia, where conservancy and water supply are unsatisfactory. In some places wells were found in the vicinity of cesspits, which were well filled.

It is not possible to introduce dry-earth conservancy owing to want of access by road to the majority of the houses, which are situated far out of the main road.

In dealing with this outbreak, too, we relied chiefly upon anti-typhoid inoculation and disinfection of infected material. It is gratifying to note that eighty people voluntarily subjected themselves to inoculation.

Houses and compounds were cleaned at Government expense. Wells, cesspits, and all the infected houses were disinfected. Special arrangements were made for the safe disposal of infected excreta.

In all fifty-three cases occurred, with fourteen deaths.

Outbreak of Plague at Moratumulla.—What would have become a serious outbreak of plague was averted at Moratumulla, one of the insanitary parts of Moratuwa town, during October, 1920, by the prompt notification of original cases and the initiation of preventive measures.

Eight cases were reported within twenty-four hours, and all these cases occurred in very insanitary and crowded huts. The source of infection was traced to Colombo, but the first case, which proved fatal, had not been reported. It is noteworthy that eight human cases (with six deaths) occurred within a radius of a quarter of a mile, but although a rat campaign was started and continued long after the epidemic had subsided, not a single infected rat was found.

The anchylostomiasis campaign, which is watched over by the Local Anchylostomiasis Committee of Control, was extended to the Western Province, and assistance is being rendered by the members of the Sanitary Branch in sanitating villages and educating people by lantern lectures, distribution of leaflets, &c. It is pleasing to record that no resistance or serious obstruction was encountered by the Directors as in previous compaigns, a fact largely attributable to the valuable assistance and loyal co-operation of the local police headmen and the Sanitary Staff.

Milk Supply.—Ninety-six samples of milk were analysed by the Government analyst, of which seventy-four were found adulterated and twenty-two were found to be genuine milk. Offenders within the Sanitary and Local Board limits were prosecuted under the respective by-laws, but there is no law to punish culprits outside towns unless they supply to residents within town limits.

Education.—Nineteen lantern lectures on hookworm disease and on general sanitation were delivered by the Sanitary Superintendent during the year.

Colonial Medical Reports.—No. 142.—Ceylon *(continued.)*

Railway Sanitation.—During the eight months, from May, 1920, to December, 1920, 989 latrines were found defective, of which 787 were attended to. 1,759 mosquito-breeding places were discovered, of which 1,020 were dealt with. In 205 cases the water supply has been found defective, of which eighty-seven were attended to. In 465 cases the conservancy were at fault, of which 386 were improved. In 499 cases the scavenging was found defective, of which 388 were improved. 1,757 premises were found defective, of which 1,554 were improved.

The following infectious diseases were reported and necessary action taken: Plague, 1; enteric fever, 3; chicken-pox, 16; measles, 18; phthisis, 2; dysentery, 1.

Twenty-one communications were addressed to the various railway authorities drawing attention to the deficiencies on which improvements were made, on the others action was deferred or is pending for various reasons. Seven reports were supplied at the request of the railway authorities.

Thirteen written notices were sent to the officers of the railway requesting them to improve premises, bungalows, &c. These notices are only sent after the inspector has reported that repeated requests have failed to get the necessary work done.

School Medical Inspection in Ceylon.—In 1919 a start was made as regards the medical inspection of children of school age and of the buildings in which they were being educated by the appointment of a Medical Inspector of Schools, and this officer has submitted a report dealing with both the English and the Anglo-vernacular and vernacular schools in the town.

Increasing attention has been given in the past twenty years in Europe and America to that branch of public medicine called school hygiene, which is concerned with all that effects the healthy physical development of the child of school age. The foundations of that branch of medicine are laid in (*a*) a system of education conducive to sound physical growth; (*b*) an appropriate school environment; (*c*) medical supervision of the individual child. Ceylon is late in making a start in this important work, but this late start, at any rate, should enable us to utilize the experience of others and adopt many of the methods of organization and practice found most serviceable elsewhere.

Those interested in the subject are advised to read the annual reports of the Chief Medical Officer of the Board of Education in England. In that country examination had revealed the disconcerting fact that one-sixth of the children of school age were so physically or mentally defective or diseased as to be unable to derive proper benefit from the education which the State provides. The medical examination of recruits needed for service in the recent Great War showed a lamentably large proportion of men with serious physical defects and disabilities that could have been prevented or remedied during childhood. No figures are available as yet as regards children in general in Ceylon, but a start has been made, as stated above, by the examination of school children in Colombo.

The problem is being taken in hand in a very comprehensive fashion in England (and in other countries) both by the Central Board of Education and by each Local Educational Authority, for its vital importance to the nation is now fully realized. It is to be hoped that extended provision for this very necessary work may be increasingly forthcoming in Ceylon.

The report of the School Inspecting Medical Officer for 1920 deals both with the English schools and with the Anglo-vernacular and vernacular schools. As regards the English schools, 4,523 scholars were medically inspected. Defective vision in 312 and ninety-six cases of other eye diseases, 140 cases of enlarged tonsils and adenoids, defective teeth (dental caries) in 220 cases, hookworm in thirty-seven cases, defective hearing in ten cases, and verminous infection of the skin in thirty-four cases were found. It was reported that the sanitary arrangements in the smaller English schools in the more crowded parts of the town call for considerable improvement and, above all, for actual supervision. A few of such schools are even now not provided with latrines at all.

As regards the vernacular schools, it is regretted that the Medical Inspector reports that there is little or no attempt to maintain any standard of personal hygiene amongst the scholars by the teachers. It is recognized, of course, that many of the scholars of these schools are drawn from a class whose home surroundings leave much to be desired. The sanitary provision made in many of these schools is very defective, and in that respect and in the school buildings themselves the contrast between these schools and the Government vernacular school in Dematagoda, Maradana, and Green Street is very striking. In these vernacular and Anglo-vernacular schools 7,232 children were medically inspected. 337 cases of defective vision and 169 cases of other eye diseases, 357 cases of enlarged tonsils and adenoids, 304 cases of dental caries, seventy-two cases of hookworm, and forty cases of verminous skin affections were found.

Where physical defects and ailments are found, it is obviously necessary to afford means of treatment for those not able to pay for private medical aid. Steps are being taken to open a clinic at the Eye Hospital for diseases of the eye, ear, nose and throat, and a clinic for general diseases at the Anti-Tuberculosis Institute. The energetic co-operation of teachers and parents will be needed to ensure that advantage is taken of these facilities for treatment; following up, and after-care will be required, and here the necessity for school nurses (of which one has since been appointed) is obvious. It is hoped to appoint a Medical Inspectress of Girls' Schools shortly.

Sanitation in general, and personal hygiene in particular, is in a deplorably backward state in the East, and it is to the satisfactory establishment of

a well-thought-out system of school hygiene that an enlightened public opinion will emerge as the scholars of to-day become the men and women of the next generation, provided they have been brought up in proper school environments, which will make them demand the same standards of hygiene in their own homes and carry out in their own personal mode of life.

(3) The number of opium depots in the Island, too, remains the same as last year, viz., fifty-four.

(4) During the year sixty-four new opium consumers were registered, as against seventy-one during the previous year.

(5) A statement of opium sold and the amount realized during each quarter of the year is appended. It will be noticed that the total quantity of opium sold for the year is less than that of the previous year, which is inserted for comparison.

(6) The amount realized out of the sale of opium preparations during the year was Rs. 9,216·78.

(7) During the year 1920 sixty chests of opium were purchased from India (approximately) for Rs. 347,349·21, as against sixty chests during the previous year for Rs. 248,211·47.

Statement of Opium sold and Amounts realized during each Quarter from January 1, 1920, to December 31, 1920.

During the quarter ended	Eating Opium: Quantity sold Grains	Eating Opium: Amount realized Rs.	c.	Smoking Opium: Quantity sold Grains	Smoking Opium: Amount realized Rs.	c.	Total realized Rs.	c.
March 31, 1920 ...	10,786,508	162,020	87	1,219,550	24,391	0	186,411	87
June 30, 1920 ...	10,390,093	156,072	63	1,233,800	24,676	0	180,748	63
September 30, 1920 ...	10,450,941	156,969	82	1,272,475	25,449	50	182,419	32
December 31, 1920 ...	10,022,303	150,530	48	1,264,150	25,283	0	175,813	48
Total for 1920 ...	41,649,845	625,593	80	4,989,975	99,799	50	725,393	30
Total for 1919 ...	44,921,416	674,494	84	4,707,275	95,945	50	770,440	34

Appendix.

Opium.

Since the previous report there have been no amendment to, or alterations of, the Ordinance.

(2) The selling price of opium remains the same as last year, viz., eating opium 1½ cents per grain and smoking opium 2 cents per grain.

Colonial Medical Reports.—No. 143.—Trinidad and Tobago.

ADMINISTRATION REPORT OF THE SURGEON-GENERAL FOR TRINIDAD AND TOBAGO FOR THE YEAR 1920.

By K. S. WISE.

Surgeon-General.

House of Refuge.

The buildings are in good condition, and some minor repairs will be all that will be required this year. The grounds have been kept in good order as usual.

The drainage is efficient, and the drains are kept in good order. The water supply is good and ample.

The dietary is satisfactory.

The pail system continues to be in use. The sewerage system would be more satisfactory if installed.

St. Augustine's Yaws Hospital.

Water supply and dietary were satisfactory.

Seven hundred and sixty cases were admitted. Of these, two were cases of tertiary syphilis, one had dysentery, two had gonorrhœa, one congenital syphilis.

The following diseases occurred in hospital: Mumps, 24; dysentery, 21; vermes, 1; diarrhœa, 1; typhoid, 2.

Five cases of leprosy admitted were transferred to the Cocorite Leper Asylum.

Deaths.—Dysentery, 2; vermes, 1; congenital syphilis, 1.

Colonial Hospital.

The training of nurses continues to be carried on in accordance with an approved syllabus and on lines which closely follow the system of English hospitals. The period of training is three years, and the efficiency of the candidates is tested at the end of each year by an examination—both oral and written.

Some changes which are to take effect in 1921 have been made with the view of improving the efficiency of the staff and raising its status.

The postponement of the erection of a Nurses Home from year to year for the last ten years is rather discouraging, as such an institution is an absolute necessity for the efficient control and administration of the nursing staff.

Extern Maternity.—The chief object of this department is to extend and popularize the midwifery service of the town so as to secure that every woman in poor circumstances has within reach a competent nurse-midwife for her confinement.

During the year 179 women were delivered at their homes, and 1,686 visits were paid to them and their infants by our nurse-midwives. Seven difficult cases demanding special obstetric skill and nursing were transferred to the Maternity Ward for their safe delivery. One hundred and forty-two expectant mothers were visited, and such advice as was necessary given to guide them safely to term.

The grounds have been kept in good order, but the walks which had been oiled some years ago show signs of wear and tear and require attention.

The water supply has been of good quality and ample, except during part of the dry season, when it was locked off from the city mains daily from 10 a.m. to 4 p.m. This caused not only much inconvenience, but created an insanitary condition, as may well be imagined in an institution with close on 400 patients.

The sanitary arrangements of the institution conform to modern requirements, but the lack of a sufficient supply of water during the time referred to above created a dangerous nuisance in the lavatories.

With the introduction of motor transport at the hospital, the stabling establishment with its attendant nuisances has been abolished with much benefit to the institution.

I wish to take this opportunity of conveying to Mr. J. W. Stephens the grateful thanks of the hospital for his generous gift of an up-to-date and well-equipped motor ambulance, the first of its kind introduced into the colony. This is a praiseworthy example that should recommend itself to other wealthy members of the community.

The diet scale of 1894 was revised during the year with the object of improving the diet, diminishing waste, and relieving the kitchen staff of much unnecessary work. The proposed new dietary was adopted provisionally with the sanction of the Surgeon-General on July 1, 1920. After three months' trial it was submitted in a slightly modified form for final acceptance, and on November 20 received the approval of His Excellency the Governor in Executive Council. A schedule of the hours of meals and order of issues has also been prepared for the convenience of the patients and the administration.

The cost per bed per diem calculated on the gross expenditure for the year was 3s. 5·4d. The cost of maintenance per bed per diem (salaries not included) was 2s. 8·7d.

The authorized number of beds in this institution is 340. Some of the wards were as usual overcrowded on account of the defective system of Poor Relief and the lack of an out-patient department at the hospital. It is to be hoped now that these subjects have attracted the serious attention of the Government, a satisfactory solution will soon be found to remedy these deficiencies. Involved in the question of Poor Relief is a point closely affecting the hospital which, I hope, will not escape the attention of the committee appointed to inquire into the whole subject. I refer to the necessity for devising practical measures and means to ensure the early treatment of the sick poor. At present a number of cases are admitted to hospital in a more or less chronic condition necessitating prolonged treatment which is not always successful.

An enteric fever ward is, for obvious reasons, urgently needed. Under present conditions the cases are treated in various wards with the risks of the spread of infection to other patients.

The greatest number of patients in hospital on any one day was 390, the lowest 272, and the average for the whole year 335.

During the year under review 6,083 cases were treated; 4,899 were discharged and 850 died. There remained in hospital at the close of the year 334 patients.

An analysis of the cases of enteric fever shows that the greatest susceptibility to the disease is between the ages of 6 and 25 years. This is in agreement with the general experience that enteric fever is a disease of youth and early adult life.

In this series males and females were equally affected, the numbers being 187 and 189 respectively.

Apart from the large number of admissions in September following the usually abnormal prevalence of flies in July and August, season does not appear to have had any marked influence on the incidence of the disease.

The most important and instructive fact revealed by an analysis of the returns is the proportionately high incidence of the disease in the unsewered parts of the town which confirms the observations of others on the subject.

Three thousand one hundred and thirty-six surgical operations, not including 2,077 minor cases attended in the surgery, were performed during the year.

Owing to limitation of space it is not possible in this report to comment on individual cases, but I wish to refer to the results of the radical operations performed in this institution for cancer of the womb from 1911 to 1917 in order to emphasize the importance of *early treatment* of the disease. The cases operated upon after 1917 are of too recent date to permit of a definite judgment as to results.

It is usual to follow such cases during the first

five years until they have reached what is generally considered the harbour of safety, but for the purposes of this report three years is a sufficiently long period of observation, seeing that about 80 per cent. of recurrences appear within the first two years after operation.

Of the twenty-eight cases reported there are only eight which do not fall within the prescribed five-year period.

From investigations the melancholy fact emerges that more than 80 per cent. of the cases of uterine cancer which were admitted to this institution from 1911 to 1917 were inoperable. This proves the necessity for *early diagnosis*, and puts a great responsibility not only on the sufferers who should in their own interests seek medical advice early, but also on the medical practitioner, who should in every case advise prompt surgical interference.

The returns also show that the disease had affected the cervix in 122 and the body of the uterus in twenty-four cases, or a proportion of five to one. Since the technique of the operation itself has practically reached its limit, the only hope of reducing the mortality is to be looked for in the *early recognition* of the disease and its prompt treatment.

The low percentage of operability is deplorable, and is not likely to improve until a campaign of education against the disease is directed mainly in informing women of the symptoms of the early stage of cancer and of the necessity for *early operative treatment*. In such a work the general medical practitioner has great opportunities which should not be neglected.

Careful investigation sustains the important fact that surgical intervention at *an early stage of the disease is very hopeful*, whilst delayed treatment is practically doomed to failure. Twenty-eight hysterectomies were performed for cancer of the uterus—twenty-three by the vaginal and five by the abdominal route. Thirteen cases were operated on in the early stage of the disease and fifteen when the condition was more or less advanced. *Of the thirteen early cases ten, or 76 per cent., are at present in good health with no sign of recurrence* from three and a half to nine years after operation. These may confidently be considered to be permanently cured.

Of the remaining three cases one succumbed to suppurative nephritis; one died of intercurrent disease seven months after operation, and at the autopsy no evidence of recurrence was found. In the third case laparotomy four months after the first operation showed general carcinomatosis of the peritoneal cavity. The patient died seven months after the operation, a result which was very disappointing in view of the institution of early treatment. Probably metastasis had already taken place at the time of the primary operation.

Curiously enough, while corporeal cancer of the uterus is obviously more difficult to diagnose in the early stage than cervical cancer, nine of the thirteen early cases in this series were the subjects of fundal cancer. It is interesting to note that five cases—three corporeal and two cervical—in which abdominal hysterectomy was performed resulted in permanent cure, but it must be added that in these cases the disease was attacked in its initial stage, which is the important point.

With regard to the fifteen patients who were operated on when the disease had been in progress for some time, only one is known to be alive and well seven years after the operation. Two died of septicæmia; six developed recurrence between six months and two and a half years after operation, and of these four are dead. Six have not been traced, and may, I think, be reckoned among the recurrences or deaths. The end results, therefore, in the advanced cases have not been satisfactory, and go to demonstrate the futility of operation at this late stage. It was only the desire to do the best that could be done for the relief of these distressing cases that prompted operation, but with ten years' experience of the radical operation, my enthusiasm has been greatly moderated by the results in cases in which the disease has passed beyond the confines of the uterus. Experience has also taught me the wisdom of selecting cases as suitable for either the vaginal or abdominal operation, as both have their advantages and disadvantages.

While the number of cases reported is too small and the data too meagre for definite conclusions on the subject, the results sustain the general experience that *operative intervention in the early stage of the disease holds out every prospect of permanent cure*, and that surgery is of little or no avail when the affection has extended beyond certain limits.

The above remarks on cancer of the uterus apply with equal force to cancer of all other organs.

I think if these facts could be brought home to the public with the dissemination of the knowledge of the early signs and symptoms of this dreadful disease better results would follow.

I have dwelt at some length on this subject as it appears to me to be very important, and this is probably my last opportunity for referring to it.

Granuloma Pudendi.—It may be of interest to record shortly the marvellous results which attend the intravenous injections of tartarated antimony in cases of ulcerating granuloma of the pudenda. This condition, apparently venereal in nature, was until recently very rebellious to treatment. Indeed, only complete excision in the early stage offered any chance of cure. When once the disease had extended over a wide area and had penetrated deeply into the tissues treatment was futile. Antimony, however, has proved to be a specific for this affection, causing entire disappearance of the condition within a very short period even in cases that were at one time considered hopeless.

During the year forty-two patients were treated with 495 intravenous injections of varying doses of a 1 per cent. solution of tartarated antimony. Although most of the patients were in the chronic stage of the disease they were discharged cured, except five who demanded their dismissal before the course of treatment was completed.

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Syphilis.—While on the subject of intravenous injections reference may be made to the treatment of syphilis with salvarsan or its substitutes. Although the recommendations of the Local Committee appointed about two years ago to report on the subject have not been put into force and no organized system of treatment has been instituted for the cure of venereal disease here, an effort is being made at the hospital to inaugurate treatment on modern lines. No arrangement, however, has yet been made to verify and control the results of treatment by the Wassermann test.

One hundred and eighty-three luetics have been treated from March to December, 1920, with 547 intravenous injections mainly of neo-arsenobillon at weekly intervals—an average of three injections to each patient with satisfactory results so far as the immediate and visible effects are concerned. The great difficulty in the way is the necessity of prolonged treatment and observation in most cases to ensure radical cure. Unfortunately the moment patients are relieved of the external manifestations of the malady they leave and seldom return for the complete eradication of the disease.

Uterine Fibroids.—The remarkably large number of abdominal subtotal hysterectomies performed during the year for fibroid tumours of the uterus is worthy of note. Sixty-one consecutive cases without a single death is a very satisfactory and encouraging record.

San Fernando Hospital.

The grounds have been kept in good order, in spite of the fact that under present labour conditions great difficulty was often experienced in obtaining efficient labourers.

The water supply was ample for our normal needs.

It is to be hoped that in the near future the town water supply will be increased sufficiently to permit of the introduction of a water sewerage system. With the undesirable habits of the class of patients forming the majority of our admissions, the pail system—which is in vogue at this institution—entails much labour and supervision to keep in a satisfactory condition, and it is becoming increasingly difficult ao obtain suitable attendants to perform such duties.

From various unavoidable causes—most especially as the paucity of contractors compelled that most supplies be obtained in the open market—it was often impossible to acquire many articles of diet (e.g., eggs, chicken, beef, &c.), and much inconvenience resulted.

A case of special interest was that of a child, aged 7 years, admitted with syphilitic stenosis of the larynx, which had become complete, necessitating immediate tracheotomy. Novarsenobillon treatment enabled the tube to be dispensed with a week later with ultimate healing.

Ankylostomiasis continues to complicate most of the acute diseases, and was largely responsible for the fact that so many dysentery cases failed to react to treatment.

The largest number of admission for pneumonia occurred during the early months of the year.

There was an exceptionally large number of admissions for scorpion poisoning.

In all these cases vomiting was a prominent symptom, while in most there was collapse. The following treatment was adopted as a routine and sufficed for all the cases except one:—

If the sting had been inflicted within about six hours of admission, an injection of (*a*) permanganate of potash solution 1 in 8,000 was administered with a hypodermic syringe around the site of inoculation; if a longer period had elapsed, this injection was omitted (unless the history was unreliable). (*b*) Normal saline solution containing adrenalin was given frequently per rectum. (*c*) Solution of hot bicarbonate of soda solution *ad lib.* by the mouth. (*d*) Stimulants by the mouth when the vomiting was controlled, otherwise hypodermically, according to indications.

The one exception was a boy aged 12 years, who was admitted in an unconscious state with convulsions, having been stung four hours previously. The above treatment having failed to cause any improvement, and as the convulsions were becoming almost continuous, 10 c.c. of a 1 in 20,000 solution of potash permanganate was given intravenously with almost immediate cessation of the convulsions and ultimate recovery.

The only fatal case occurred in a child aged 2 years, who, when apparently doing well, died suddenly twelve hours after admission. Post-mortem examination revealed all the classical signs of status lymphaticus.

Two fatal cases of tetanus were transferred from Couva and arrived in a moribund condition. In the remaining eight cases antitetanic serum was given both intravenously and subcutaneously. Seven cases occurred in children from 3 to 15 years old; and in three cases, neglected chigoes was the site of infection.

The treatment of eclampsia continues to give very satisfactory results.

In this series of sixteen cases the child survived in nine instances.

A peculiar feature was its almost "epidemic" nature. Four cases were admitted within twelve hours.

One case was admitted with the history of fever for some days previously, which persisted after delivery and disappearance of albuminuria and convulsions; her blood subsequently yielded a positive Widal reaction.

One case recovered without delivery, which took place five weeks later; and another developed a cerebral embolism which protracted her stay in hospital.

Injuries.—Case I was a girl, aged 14 years, admitted with gunshot wounds in the right ileo-femoral

Return of Diseases and Deaths in 1920 in the Colonial Hospital, San Fernando Hospital and District Hospitals.

Trinidad and Tobago.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	16	—	16
Anæmia	39	7	40
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	139	44	150
Delirium Tremens	6	1	7
Dengue	—	—	—
Diabetes Mellitus	16	4	18
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	—	—	—
Enteric Fever	754	191	808
Erysipelas	11	2	11
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	328	—	333
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	38	3	41
Kala Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	4	—	4
(*b*) Anæsthetic	10	1	10
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	560	69	575
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	71	—	75
(*c*) Pernicious	149	44	149
(*d*) Malarial Cachexia	81	2	85
Malta Fever	—	—	—
Measles	1	—	2
Mumps	—	—	—
New Growths—			
Non malignant	23	—	23
Malignant	4	1	4
Old Age	109	60	117
Other Diseases	250	70	267
Pellagra	5	3	5
Plague	—	—	—
Pyæmia	1	1	1
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	84	2	89
Rheumatoid Arthritis	64	—	68
Scarlet Fever	1	—	1
Scurvy	—	—	—
Septicæmia	8	8	8
Sleeping Sickness	—	—	—
Sloughing Phagedæna	9	—	9
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	98	—	101
(*b*) Secondary	84	—	89
(*c*) Tertiary	227	9	240
(*d*) Congenital	20	11	20
Tetanus	22	14	32
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	3	—	3
Varicella	—	—	—
Whooping-cough	12	—	13
Yaws	24	—	24
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	442	13	459
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	190	44	203
(*b*) Other Diseases	93	38	103
Digestive System—	—	—	—
(*a*) Diarrhœa	298	79	302
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	15	—	15
Congestion of Liver	4	—	4
(*d*) Abscess of Liver	10	2	10
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	6	3	6
(*g*) Cirrhosis of Liver	93	45	101
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	1,067	195	1,099
Ear	29	—	32
Eye	446	—	471
Generative System—	—	—	—
Male Organs	795	21	815
Female Organs	785	38	806
Lymphatic System	84	1	87
Mental Diseases	281	59	304
Nervous System	105	8	107
Nose	67	1	68
Organs of Locomotion	213	8	222
Respiratory System	1,049	385	1,126
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	39	—	39
(*f*) Other Diseases	979	29	1,069
Urinary System	667	201	693
Injuries, General, Local—	—	—	—
(*a*) Sirisis (Heatstroke)	—	—	—
(*b*) Sun-stroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	—	—	—
Ascaris lumbricoides	13	—	13
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	753	102	800
Filaria medinensis (Guinea-worm)	5	—	5
Tape-worm	—	—	—
Poisons—	—	—	—
Snake bites	3	1	3
Corrosive Acids	1	—	1
Metallic Poisons	1	—	1
Vegetable Alkaloids	24	5	24
Nature Unknown	—	—	—
Other Poisons	108	2	108
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
Minor	—	—	—
Other Operations	791	17	827
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

region. It was impossible from the symptoms to be certain whether there was any internal lesion. Under a general anæsthetic the wounds were exposed and traced into the abdominal cavity, which was accordingly opened, revealing that one shot had perforated the mesentery to the cæum and ruptured one of the ileo-colic vessels, from which hæmorrhage was taking place, into the peritoneal cavity. The shot was removed, the wound ligatured, and abdomen closed, resulting in recovery.

Case II was a youth, aged 18 years, who fell from a tree and was impaled by a broken branch. On admission there was a ragged abdominal wound to left of umbilicus, from which a portion of intestine was prolapsing; there was a second wound in the right flank below the liver. Laparotomy revealed a wound in the transverse colon and a perforation of the meso-colon. These were sutured and drainage instituted, as the wounds were contaminated; recovery resulted.

Case III.—A woman, aged 20 years, was transferred to us from one of the district hospitals to which she had been admitted the previous day with history of a stab wound in abdomen. It was considered at the time that the wound had not entered the abdominal cavity, and consequently the transfer to us was not made until the following day, when definite abdominal symptoms had developed. Laparotomy was immediately performed, and revealed that the small intestine had been divided in two places, the mesentery wounded, and intraperitoneal hæmorrhage taken place. She succumbed the same evening.

These three cases are instructive, in that, in Case II, the indications for immediate operation were obvious; while the difference in the results obtained in Cases I and III demonstrate that all wounds of the abdominal wall should be thoroughly exposed and traced to their termination without delay.

Ascarides plus Trauma.—A boy, aged 8 years, was admitted with an "acute" abdomen and history of having received kicks thereon. Laparotomy revealed clear serous effusion in the peritoneal cavity and *Ascarides lumbricoides* within the gut.

Evacuation of the fluid and subsequent administration of anthelmintics resulted in the disappearance of all symptoms.

Ovarian Cyst.—This case was bilateral, both cysts being the size of footballs. Double ovariotomy was performed. As no ovarian tissue could be left behind, remnants from the cysts' walls were grafted into the cellular tissue of the abdominal wall by stab punctures. These wounds healed by first intention, and she has menstruated regularly ever since.

Extra-uterine Pregnancy.—A case of ruptured ectopic pregnancy—where the sac had consisted of the dilated fimbriæ, and the rest of the Fallopian tube was apparently normal—suggestive of a "tubal abortion." This patient very nearly lost her life through postponing her consent to operation interference until her condition had become very critical.

Uterine Fibroids.—Subtotal hysterectomy was performed, and in one case an abnormally large fibroid, weighing 14 lb., occupied the almost entire abdominal cavity; myomectomy had to be performed before the uterus—which was studded with small fibroids—could be excised.

Myomectomy—after laparatomy—was performed for a single fibroid which was so calcified that a spicule had forced itself upwards from the lower uterine segment between the bladder and uterus, until it projected between the recti muscles, causing distressing symptoms.

Lunatic Asylum.

St. Anne's Asylum,
Trinidad.

Influenza appeared among the inmates and staff during the early months of the year. As it was possible to deal with it in its earliest stages it ran a mild course, and did not seriously impair the general health of the institution.

Twenty-four cases of phthisis and four of pneumonia were reported during the year. Associated with a vigorous campaign against flies there was an appreciable diminution in the occurrence of asylum dysentery.

The scheme of a supplemental water supply which is on the point of being completed will, it is hoped, remove the drawback of an inadequate supply which the institution has suffered from for many years during the dry season.

Notwithstanding the limited workshop accommodation, the work accomplished by the inmates under the direction of the attendants was valuable from a therapeutic as well as from an economic point of view.

The yield of ground provisions was up to the average of recent years.

Leper Asylum.

The general accommodation of the institution, both for staff and inmates, is ample.

The buildings are in good condition.

An extension of the present infirmary for males is urgently needed. Whenever wards become available upon removal of the good cases to Chaeachacare provision could be made to meet this requirement. The present infirmary should be removed entirely. Certainly it is not placed in good position—adjoining the kitchen and in close proximity to the latrines and rubbish heaps. A new isolation ward for the sisters is nearly erected and will soon be ready for occupation.

At the year's end Mdme. Alma Simpson's wish to the institution was realized, and a well-equipped cinema lantern stood ready to be opened by His Excellency the Governor. But this was not the only thing which that excellent lady achieved; she

has been instrumental in the creation of a permanent committee to provide recreation funds to promote the happiness of these sufferers.

The dietary is ample and nutritious, and the water supply is adequate and excellent in quality.

There were forty-three deaths, which yield a death-rate with a population of 506 souls of 84·98 per thousand. The bulk of the patients are drawn from the labouring class.

The gynocardate of soda treatment by intramuscular injections was continued throughout the year, and the younger members of the community seem to be those most benefited. The treatment should be continued. From American leprosariums most favourable reports have been received of the gynocardate inoculations, but of another form of this drug. I trust we shall soon be able to secure this medicine.

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ADMINISTRATION REPORTS OF THE MEDICAL INSPECTOR OF HEALTH, THE MEDICAL OFFICERS OF HEALTH AND THE PORT HEALTH OFFICER FOR TRINIDAD AND TOBAGO FOR THE YEAR 1920.

Vital Statistics.

Population.—This was estimated by the Registrar-General to be 388,863 at the middle of the year. The density per square mile was 208 as compared with 202 for the previous year.

Births.—The total number of births registered was 11,707; of these 6,065 were males and 5,642 females. The birth-rate was 30·15.

Deaths.—The total number of deaths was 9,238. The death-rate was 23·75 per 1,000. This figure shows an improvement on the rate for 1919.

The number of stillbirths registered was 866.

Infantile Mortality.—There were 2,048 deaths of infants under 1 year of age. The infantile mortality rate for the whole colony was 174·93. For the rest of the colony the rate was 166.

The high proportion of stillbirths to total births and the associated high infantile mortality rate constitute an unsatisfactory record.

Stillbirths and deaths of infants under 1 year are intricate public health problems, and are intimately related to ante-natal morbidity.

Exact knowledge of the causes of stillbirths is scanty.

The following broad statements indicate the lines of general agreement with regard to stillbirths:—

(1) There is apparently little difference in the number of stillbirths in what may be considered poorer or healthier districts.

(2) Fertility has an important bearing on ante-natal morbidity. Dr. Stevenson, Superintendent of Statistics in the Registrar-General's Office, London, in a paper read before the Royal Society, remarked that "it seems probable both that in many cases children die because many are born, and that many are born because comparatively few survive."

(3) Industrial work does not appear to react as unfavourably as was generally accepted.

(4) The most important factor is the health of the mother.

Infantile mortality also varies widely in different districts, and here again the factor of most value in prevention is the personal one.

It follows, therefore, that the Child Welfare Movement, which includes ante-natal clinics, infant consultations and employment of district nurses and midwives, and has as its fundamental principle education in health, is a measure admirably suited for dealing with these problems.

It can be confidently expected that as this movement spreads and awakens and stimulates the pride and interest of mothers, so will the losses which are largely preventable—in these two directions—diminish.

The Child Welfare League, which was established in 1918, continued its work in Port-of-Spain and at St. Joseph with very satisfactory results.

Notifiable Infectious Diseases.—On account of the prevalence of alastrim in Jamaica, chicken-pox was proclaimed an infectious disease on October 19.

Enteric Fever.—There were 1,206 cases notified with 295 deaths as compared with 729 cases in 1919. This increase was due to the prevalence of cases in Port-of-Spain, the St. James area of the Diego Martin District, St. Ann's, Tacarigua and Erin-Siparia over a series of months.

Several cases also occurred at Tobago, a district which had been hitherto free from this disease.

On investigation, the grouping of cases, the age incidence, and dates of attack indicated direct contact as the most common method of transmission.

There were ten cases of diphtheria notified with two deaths—one in Port-of-Spain and the other in Arima.

The number of deaths from all forms of tuberculosis during the year was 529; of these 235 occurred in Port-of-Spain and 294 in other parts of the colony.

The rate for 1920 was 12·8 per 10,000 of population.

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(*continued.*)

The number of deaths from pulmonary tuberculosis was 499. Of these 222 occurred in Port-of-Spain and 277 in other parts of the colony.

A comparison of the number of deaths from and the number of notifications of pulmonary tuberculosis shows that many cases of the disease are not notified.

	1919	1920
Deaths	475 ...	499
Notifications	395 ...	552

The increase of cases this year is due to a larger number of notifications from rural districts, and does not indicate an increasing prevalence of the disease.

It should, I am of opinion, be regarded as an encouraging feature, for each case notified affords the opportunity for investigation and education in the correct principles of prevention at a new centre.

The number of cases of pneumonia notified was 264 as compared with 352 in 1919, when the disease was made compulsorily notifiable. The deaths during the last six years were: 1915, 254; 1916, 234; 1917, 267; 1918, 297; 1919, 285; 1920, 244.

The epidemic prevalence of influenza in 1919 accounts for the high mortality in that year, but it is of interest to note that this disease is responsible for many deaths in periods when influenza is not epidemic.

There were twenty-three cases of chicken-pox notified—eighteen in Port-of-Spain and five from rural districts.

No case of plague, small-pox, or yellow fever occurred.

Malaria.—The mortality for 1920 of 864, or 22·2 per 10,000 of the population, is a very imperfect measure of the toll taken by malaria, for this disease, in addition to direct or indirect contribution to the death-rate, is the cause of most of the general ill-health and physical inefficiency in the colony.

The number of deaths from ankylostomiasis for 1920 was 276.

The Ankylostomiasis Commission continued its intensive campaign in the Carapichaima and Diego Martin (including St. James District) areas.

In co-operation, efforts made by the Central Board of Health to have sanitary latrines installed in these districts in advance of the work of the Commission met with fair success.

The resolution of the Central Board of December 23, 1919, recommending that fæcal pollution of soil in the vicinity of dwellings be made an offence punishable on summary conviction was given effect to by an amending ordinance which was proclaimed on May 26, 1920.

From the standpoint of crude death-rate this year shows an improvement over last year, but compares unfavourably with the mean number of deaths, and the death-rates for the five years 1915-1919.

The diseases selected for the purpose of this return are among the principal causes of death.

Several of these are communicable diseases and so largely preventable. It is now generally recognized that public health measures of permanent value must rest on an educational foundation, and that measures of prevention should be applied in the house before the occurrence of or in the early stages of the disease.

In the training of sanitary inspectors the importance of influencing public opinion by educational methods is continually insisted on with the aim of establishing the policy that the function of these officers is not only to detect and order the removal of conditions prejudicial to health, but also to give such advice and instruction as will result in the prevention of disease.

When the objects indicated above are attained the co-operation between the general public and sanitary departments which should follow will be a valuable step in promoting health conditions in the colony, and the work of public health officers will not be the uphill task it usually is.

Public Health Administration.

The following circular was issued to local authorities of rural districts:—

Insanitary Conditions of Rural Districts.

The Chairman, Local Authority,—

After discussion arising out of the papers dealing with the drainage of the Chaguanas villages at a meeting of the Central Board of Health, it was recognized that in special circumstances public works are now urgently called for requiring financing and constructing by the Government solely in the interest of the public health and without reference to the financial position of the district concerned. It was therefore decided that local authorities be invited to submit reports on the insanitary conditions of such character affecting adversely the general public health of their districts.

It was suggested that the reports should include:—

(1) Drainage of districts generally.

(2) Any exceptional trade nuisances.

(3) Urgency of scavenging and disposal of refuse.

(4) Special conditions predisposing to malaria (swamps, tidal lagoons, &c.).

The urgency of water supplies and sewage disposal need not be included as these are now under consideration.

The Board was of opinion that this information would facilitate a comprehensive view of these conditions over the colony and would enable it to make arrangements to deal with them in order of urgency and importance.

Tacarigua District.

The chief circumstances are the same as in my previous reports, viz.:—

(1) Bad water supply of Arouca and small villages along the Eastern Main Road.

(2) Unsafe water supply in the Tacarigua District and El Dorada Village.

(3) Bad state of the drains, especially along the Eastern Main Road.

(4) Bush in many vacant spots of land.

(5) Mosquito breeding places in the shape of stagnant ravines, holes, &c., in various parts of the district.

(6) Dust from the Eastern Main Road in the dry season.

(7) The want of latrines in some of the smaller villages and outlying districts.

Typhoid fever is practically endemic, and I think the time has arrived when special measures should be taken to deal with it effectively and stamp it out. This can only be done by thorough and early isolation.

General and Special Inquiries.

Dr. Dickson, Acting Medical Inspector of Health, visited the Streatham Lodge area, along with Dr. Smith (Acting District Medical Officer), in connection with the prevalence of typhoid fever there.

Work performed by Sanitary Inspector.

The sanitary inspector worked well, but the work appears to me to be too much for one man to perform satisfactorily.

Attached is a tabulated return of the work performed during the year, and a glance at it will show the large amount of work performed.

Conditions affecting Wholesomeness of Milk.

These conditions have improved. The dippers are seldom seen with milk vendors; the cowsheds are on the whole kept cleaner. Seventy-nine have been registered.

Conditions affecting Wholesomeness of Foods, &c.

These, I am pleased to say, are also much improved. The use of trays with covers for the protection from flies and dust has been gradually enforced, and vegetables and fruits, &c., are usually exposed for sale on tables or boxes instead of on the ground.

Sufficiency and Quality of Water Supply, &c.

Tunapuna is fortunate in having a good water supply. It is of good quality and sufficient. Part of Tacarigua, Orange Grove Estate, and El Dorado Village are supplied from the Tacarigua River. There is a constant and abundant supply, but the quality is at times doubtful, I think. Streatham Lodge also has a constant and abundant supply of water from the upper parts of the Dry River. The quality appears to be good.

Arouca derives its water supply from wells and a branch of the Garden River. The water from the former is uncertain and probably bad in a few cases. Some wells have been closed, where the water was found to be bad and their position too near the latrines. The water from the river is good and constant, but as it runs along the road drain before reaching Arouca is very liable to be contaminated.

State of Streams and Rivers, &c.

These are much the same as in my previous reports.

The part of the Dry River near the bridge where it crosses the Eastern Main Road at times gives off an offensive odour and requires constant attention. The main drains running in a southerly direction across Tunapuna are also at times in a very bad state and have to be constantly attended to. Concrete is the only remedy, and I consider it an urgent necessity.

Characters and Sufficiency of Arrangements for Drainage, Sewerage, &c.

These are satisfactory on the whole in Tunapuna and Arouca. The concreting of the three main drains, or rather ravines, across Tunapuna is urgently required, as well as one in Arouca (Jean Berté).

The drains on the sides of the Eastern Main Road are usually in a bad state, being choked with rubbish and grass.

There is a semi-sewerage system in a few residences. Nearly all the premises have the ordinary pit system, while a few have the pail system.

The night soil from the District Hospital and Orphan Home and a few residences is removed and buried at regular intervals. The majority fill up the pit and remove the superstructure to a new site.

Privy, Water-closet Accommodation, &c.

In five places the semi-sewerage system exists (the district medical officer's residence and four private dwelling houses); in eight places the pail system is used (three railway stations, Tunapuna Government School, Tacarigua Orphan Home, Tunapuna Constabulary Station, Warden's office, and one private dwelling house). The pit with a superstructure is used in all other cases. At the District Hospital both the pail and pit systems are in use.

It is satisfactory to record that out of 598 dwellings in the district only forty-seven are without any privy accommodation. In Tunapuna only three places out of 309 are without privies, and in Arouca five out of fifty-one. This is due to the fact that the old structures have been allowed to get too bad for any further use.

Arrangements for Removal of House Refuse, &c.

This is being carried out by means of the scavenging carts in a fairly satisfactory manner. In the smaller villages the rubbish is burned.

The usual boxes, pans, barrels, &c., are still used for collecting the rubbish from houses. The proper dustbins are not yet in evidence as it has not been considered advisable to enforce the regulations at present.

Vital Statistics.

I have estimated the population of the whole medical district as 17,350 on December 31, 1920.

There has been a good deal of sickness throughout the year. No doubt the effects of poverty and privation experienced during the period of the war are still being felt.

Annual Health Report, 1920, County of St. Andrew.

During the months of July, August, September and October dysentery declared itself throughout the district. It appeared to be of the amœbic type of infection, and its control in the main could be effected by emetin. The water supply, I fancy, is the chief factor at fault, and I am of opinion that it is possible to eliminate such a recurring annual if a proper supply of potable water could be obtained.

There was one special inquiry made by the sanitary inspector at my request in connection with a series of cases of dysentery which occurred in a family on an estate at Caigual. Here about eight persons were attacked, and three of these succumbed. The sanitary conditions were far from being satisfactory, and the source of propagation was very obvious, as a large dung heap near the stables in close proximity to the living rooms provided a swarm of flies which had easy access to their uncovered and frequently used utensils and to the unprotected food supply of the family.

At present thirty-one persons are licensed for the hawking and vending of milk. Personally, I would prefer to see the day when the sale of fresh milk as carried out at present be superseded by the tin arrangement.

The conditions affecting the wholesomeness of food sold and produced in the district are very far from being satisfactory. At the present moment, in view of the fact that all the footpaths in the Cunapo Village being the property of private individuals is utilized for the sale of these commodities, vendors are permitted for a small consideration to squat along the principal thoroughfare of the district vending their stuff in a babel of tongues to the passers-by who themselves are striving with the flies to get first service. These conditions seem to be a travesty on and a pantomime of the ordinary principles of sanitation. I would therefore recommend to the local authority the desirability of calling on the Government for their sanction in the compulsory purchase of the whole of the footpath along the Cunapo Road in the village; the erection of a suitable market on the main thoroughfare, and the compulsory drive of at least the vendors of meat and fish into the market. After this is done it may be possible to introduce the measure prevailing in Jamaica, I understand, for inducing the people to make use of the market by defining by proclamation the boundaries of the large villages in the colony where markets exist, and by notice boards placed at the main entrances of these villages that any food used for human consumption must not be hawked about nor yet sold in the villages except in the market place. In respect to the places for slaughtering there are at present three such. Those can at best only be called makeshifts.

The water supply of the district generally and for the larger villages is really what can be collected in barrels and other receptacles from the rainfall. This is but a very unsatisfactory method of water conservancy. It is admitted on all sides that unless a satisfactory water supply can be established in a community the arrangements for carrying out public health necessities cannot be placed on a satisfactory basis; the people generally are compelled by sheer necessity to keep barrels and receptacles for storing water which cannot be kept free from mosquito larvæ and the water-borne parasites. The campaign against malaria, for instance, is made abortive, as prosecutions in connection with offences against keeping stagnant water and the possibilities of breeding larvæ cannot be conscientiously instituted against offenders. Those who are not fortunate enough in obtaining these receptacles for storing drinking water are forced to make use of the nearest streams or rivers, and those for the most part constitute the main sewers of the villages along their banks. I understand that a copious supply of good potable water can be obtained for Cunapo Village by gravitation from the Cuare River. It would be feasible to investigate such a source of supply and so demonstrate to the rest of the island similarly situated the possibility of utilizing such sources of supplies. Unless practical steps are taken in this connection at an early date there is no doubt in my mind that the best interests of the colony will be prejudiced.

Wherever the drainage of the district is efficient the praise, if any, has to be attributed to Nature. When you conceive that the whole of the Cunapo Village is below the level of the thoroughfare and the public drains it can easily be conjectured how waterlogged must be the householders' premises. The situation calls for the wholesale filling in and regrading of drains of the whole village; when this is accomplished the next point is where to lead the water to. The most natural place is the Cunapo River, but as this is utilized by a large number of people for drinking purposes in the time of drought, its further pollution cannot be entertained. Here again a proper system of potable water comes in, and unless this is provided it seems an insurmountable task for the local authority to maintain efficient drainage.

Much has been done by the sanitary inspector by way of enforcing the erection of and the maintenance of proper closet accommodation. Whenever these exist an approved form of superstructure has been advised admitting of proper ventilation and inaccessibility to flies by gauze netting of proper mesh. The serious difficulty is their maintenance in their original form. In the majority of cases the type of privy is the pit dug in the ground with a wooden superstructure and a flap cover on the seating accommodation to remain at all times sealed when not in use.

Ortoire-Moruga District.

Morbidity.—During the year there were no epidemic outbreaks of infectious disease.

Dysentery was present in scattered cases during the whole year, but during July, August and September it assumed almost epidemic proportions.

There were twenty-five deaths registered during the year, and nineteen of these occurred during the three months mentioned. This disease will always give serious trouble in the country districts where no check can be kept on the propagation of flies. In my opinion a very large majority of the cases of dysentery in Trinidad is due to fly-borne contagion.

Malaria continues very prevalent in the district, and, I am afraid, will so continue for a long time. I can see no method of seriously reducing it in a rural district of scattered habitations surrounded with bush and trees covered with water-retaining epiphytes, and with pools and stagnant water drains and ravines freely scattered about. Mosquito prevention work in such a district seems to me to be a "ploughing the sands."

Whooping-cough was very prevalent during the first seven months of the year. There were a large number of cases, and seventeen deaths were registered from that disease. This infectious disease is far too much neglected in Trinidad. Children suffering from this complaint are allowed by their parents to go about as if in perfect health and to mix freely with other children, with the result that the disease is spread far and wide, and, in the case of the sufferers, bronchitis and pneumonia supervene with grave danger of death.

Yaws.—Early in the year I began injecting cases of yaws with novarsenobillon instead of sending them to St. Augustine. During the year I treated 198 cases. In 180 of these all symptoms disappeared after one injection, fourteen required two injections, and one required three. Another case that had already received two injections at St. Augustine received four more from me, but is still uncured. I am glad to be able to report that in no case was there any ill-effects from the injections.

Sanitation.—At the beginning of the year very few premises had any latrine accommodation. By the end of the year a large number were provided. The effort is to be continued during 1921, and I hope to be able to report next year that a great majority of the premises in the district are provided with this very necessary adjunct.

The water supply continues very unsatisfactory, and, unfortunately, there seems no prospect of amelioration.

Erin-Siparia District.

As in most parts of the colony, malaria heads the list as a cause of disablement and death, 20 per cent. of the total deaths being due to this isease.

Of persons attended medically a large percentage were cases of malaria—at certain times of the year as many as 90 per cent.

Apart from malaria, the most prevalent diseases were ankylostomiasis, typhoid, dysentery and pneumonia.

Inquiries were made into the housing condition in certain parts of the district where a rapid rise in population has taken place due to the influx of a labouring population required for the development of oil fields.

In certain cases the labourers are allowed to live among the crudest and most insanitary surroundings which call urgently for improvement.

No change in the condition of the water supply took place during the year.

In parts of the district where oil boring operations are in progress from time to time pollution of streams with oil occurs. The extent to which the drinking water of the people was affected seems to be negligible. In all probability oil pollution tends to render a district more healthy from the effect on mosquito breeding.

The efforts of the sanitary inspector were persistently directed towards the improvement of latrines, pits and privies generally. His work appears to have had good results, but much more remains to be done.

Scavenging carts remove house and street rubbish from the larger villages and place it in dumping grounds.

Cedros.

Circumstances affecting the Health of the District.

The Cedros medical district is regarded as a particularly unhealthy one. The causes of this unenviable reputation are not difficult to detect.

The greater portion of the district consists of extensive low-lying areas of swamps and lagoons running into each other during the wet season by surface channels, and during the dry season by subterranean connections, forming permanent collections of stagnant water, breeding in abundance the anopheles and other mosquitoes. Enclosed within these swampy areas and lagoons are uniformly flat surfaces of raised beach and estuarine formations, over which are scattered centres of population. Malaria in its various manifestations is consequently particularly prevalent throughout the district. The remaining portion of the district consists of comparatively healthy and hilly areas, most of which is, however, scantily inhabited.

In the establishment of a new settlement an adequate supply of potable water would appear to constitute a prime necessity, but it is a strange anomaly that in Cedros villages have sprung up in the western portion where there is a total absence of any natural source of drinking water, and the eastern half of the district, which is liberally provided by Nature with many a pure supply, is only sparsely and scantily populated, the greater portion of the land being unalienated. The want of provision of a public supply of water to compensate for this natural deficiency compels the inhabitants of the district to improvise various insanitary and primitive methods for obtaining and storing water—a prime necessary of life—leading to a deterioration in the general health of the district and an increase in the incidence of water-borne diseases.