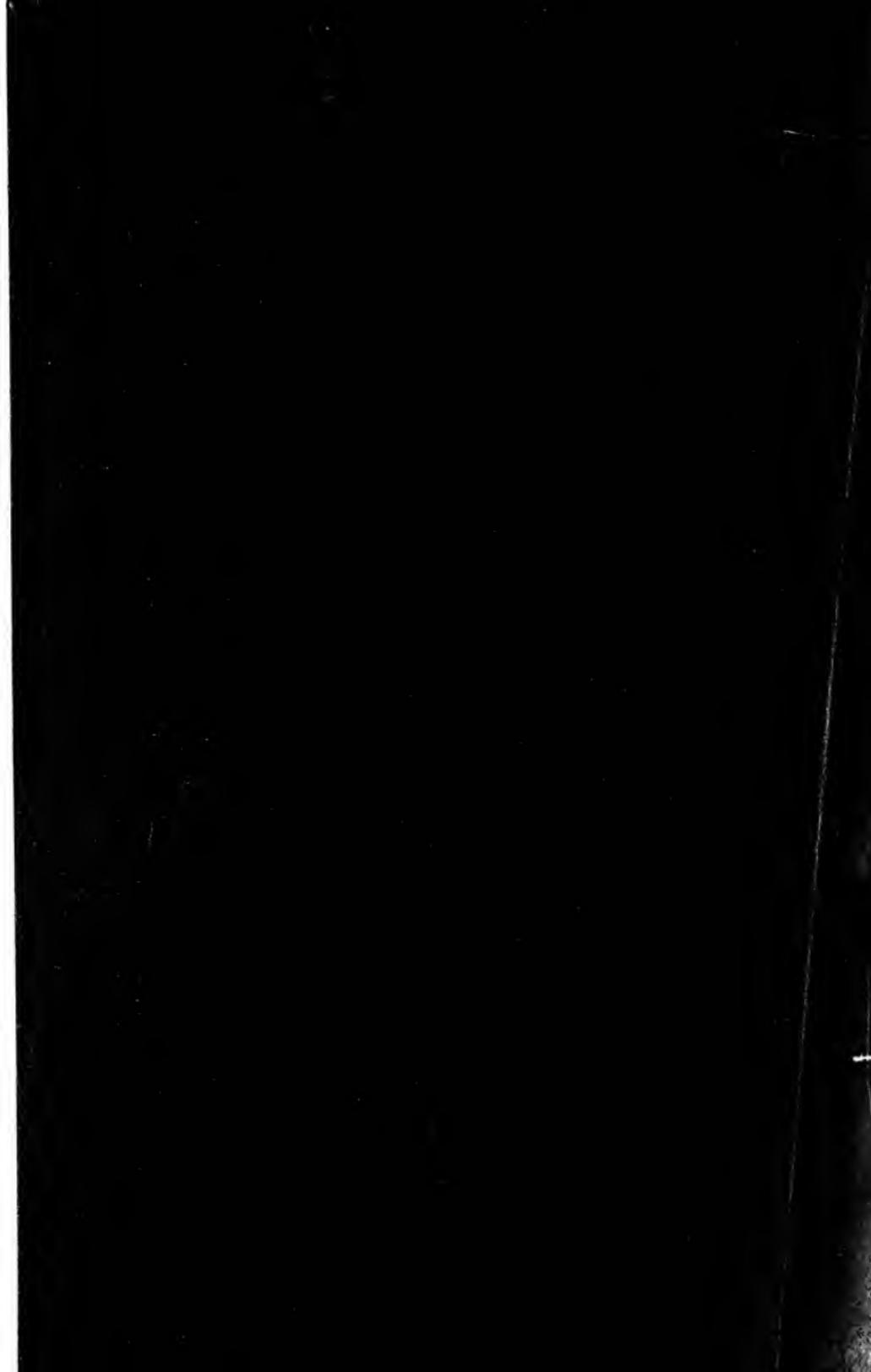


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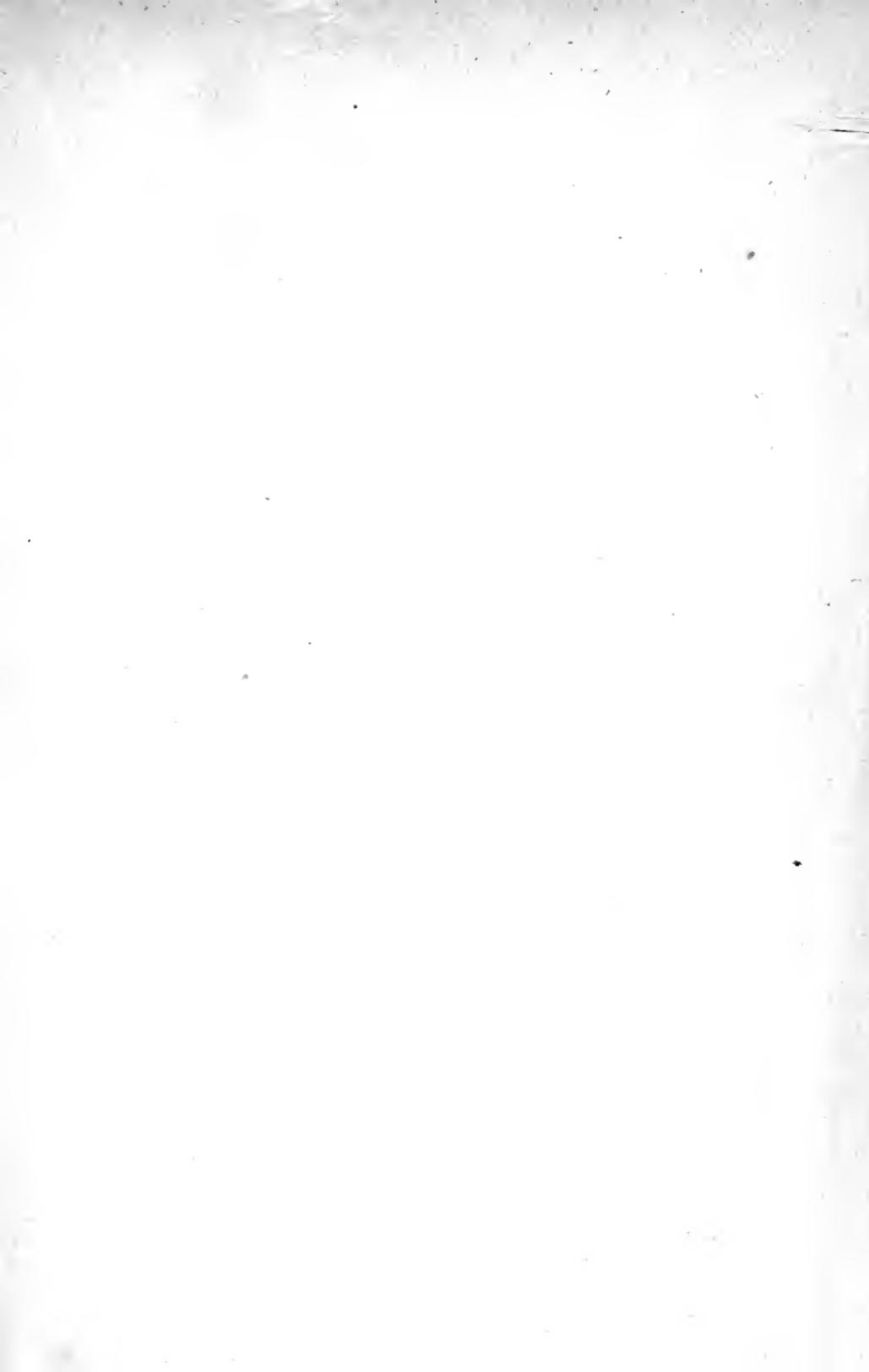


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DISEASES OF TROPICAL CLIMATES



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DISEASES
OF
TROPICAL CLIMATES

LECTURES

DELIVERED AT THE ARMY MEDICAL SCHOOL

BY

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To old "Netley men," wherever they are serving their country, this brief summary of the Lectures on Tropical Medicine, "once delivered" to them during the brief season of their probation, is dedicated with a renewed expression of the warm interest and goodwill of their friend and former teacher.

"QUI MONET AMAT, AVE ET CAVE."

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DISEASES OF TROPICAL CLIMATES

INTRODUCTORY LECTURE

GENTLEMEN—Meeting you here for the first time, it is necessary for me to give you some explanation of the nature and scope of the course of instruction on which you are about to enter. The chair I have the honour to fill in this school is that of Military Medicine. It is my business to deal with the diseases apart from the battle and other injuries to which soldiers are liable in the course of their service.

The subject of military medicine is a very wide one, so much so, that with the time at my disposal it is impossible for me to deal with it in its entirety. Fortunately the scheme of study here has been so arranged as in a great measure to meet this difficulty.

One course supplements another ; some subjects that might with propriety be dealt with from this chair, fall as naturally into the course of Military Hygiene, and are taken up by my colleague, the professor of that branch. The Professor of Pathology, in like manner, is able to deal with the morbid anatomy of some diseases more minutely than the time allotted to me enables me to do.

The part of the course on which we enter to-day is entirely devoted to Tropical Medicine.

Let me first invite your attention to two important aids to the study on which you are about to enter. The great hospital in which we are assembled is intended for the reception of invalids from every part of the world where the British soldier serves, whether suffering from disease or wounds; opportunities are thus offered to you to study the effects of various climates and diseases, as yet foreign to your experience, on the persons of those who, under due supervision, will be committed to your care in the wards. This was the chief motive that governed the senate of the Army Medical School, acting in this, as in all other matters, with the sanction of the Minister for War, in selecting the Royal Victoria Hospital, Netley, as the home of the school, in the face of objections to such a selection of considerable weight, viz. its distance from London, cutting the professors off from the great centres of medical education, and profitable intercourse with metropolitan teachers and scientific societies.

The next is the Pathological Museum of the Medical Staff of the Army, which has found a permanent home in this hospital. It is not too much to say of this collection that, as an aid to the study of military medicine and surgery, there is no museum in this country like it. The teachers here find on its shelves material to illustrate every disease and injury to which the soldier is liable, and its doors are open to you during all working hours for private study.

If you, as many have done, ask what is the necessity for special instruction in the diseases of hot climates? I answer, that the subject is not taught in the civil schools, partly for want of time and the needful opportunities for the study of such diseases on the part of the teachers, and the necessary material for bedside illustration so abundantly supplied here; but, above all, because 60,000 British soldiers are always serving in India, requiring a large staff of carefully instructed and trained medical officers for their care. Nor is this all. Side by side with those who devote their lives to the service of the British army sit a body of gentlemen, for whose benefit, no less than for theirs, this school was established. For them the study of tropical medicine is of vital importance. All their professional lives will be spent in India; on them the medical charge of a large native army will devolve, without the aid of which it would be impossible to hold India as a British possession, except at a sacrifice which England has neither the means nor the inclination to make. To them will in the future be committed the care of the valuable lives of those charged with the civil administration of India, and from the ablest of them the selection of teachers will be made to fill the chairs of the medical and allied sciences in the colleges established by an enlightened Government, and to be its advisers on all questions affecting the health of the 200,000,000 of people of the various races of the Queen's empire of Hindostan.

Before entering on the study of the diseases which

are the chief factors of mortality and invaliding in India, it will not be out of place to take a retrospective glance at the causes which, in past times, were most active in conducing to the immense mortality and invaliding which were first brought to light by the statistical inquiries of Sir Alexander Tulloch and Dr. Balfour, and subsequently by the Royal Commission appointed to report on the health of the army of India.

According to the Commissioners the death-rate of the British soldier from the first occupation of the country, down to the time immediately preceding the appointment of the Royal Commission, 1860, oscillated round 69 per 1000. They did not say that this number died every year, still less that men died at this rate at all the stations where they were quartered; during the Mahratta war it was as high as 134 per 1000, and in 1852 it was as low as 40 per 1000.

In India, as at home in the pre-sanitary age, the great aim of the local authorities was to confine the efforts of medical officers as much as possible to the *cure* of disease. Military men in all ages and in all countries have been impatient of medical "interference" in matters affecting the health of those under their command. "Medical advice" (by which was meant advice on the prevention of disease), said a General, whose army was melting away from preventable causes, "is a very good thing when it is asked for," which it never was by this commander, whose army in Burma lost 113, 106, and 130 per 1000 in the three years 1824-26. Authorities, civil and military alike, were of opinion that the diseases

of India arose from causes beyond human control; as they could not be "cured" they were to be "endured," and as little said about them as possible.

In time, however, a change was gradually brought about. The sanitary movement in England had a great effect; slowly the dawn of a better day appeared; the exhaustive and fruitful inquiry into the health of the British army, followed by a like measure for the army of India, in both cases conducted by Royal Commissioners, gave an impetus to the sanitary movement. The Government of India was at last roused to action, and entered on the work of sanitary reform under the guidance of sanitary commissioners selected from their own service, with intelligence and zeal, and with results which will be developed in this course of lectures. Sir Ranald Martin, formerly a medical officer of the Bengal army, was an active member of both commissions, as he was of the commission to which England owes the Health of Towns' Act, the Magna Charta of British Sanitary Reform; and both armies owe a debt of gratitude to the labours of this distinguished and large-hearted man, in a small degree commemorated by his personal and professional friends, who knew him well and loved him much, in the memorial gold medal competed for by those in this school who, animated by his example, seek to follow in his footsteps.

Let us look more closely at this part of our subject. Going back many years we find it was the custom to send troops to India in a class of ships ill-adapted and fitted for such a purpose; very inferior in point of

speed, the voyage, often extending over six months, sometimes reached nine in duration. Overcrowding was the rule, the ration was ill-suited for so long a voyage, and often deficient in anti-scorbutic elements. The mortality in these prolonged voyages was always considerable, sometimes shocking. We read of 170 men dying in the Hoogly in one ship, after such a voyage, between the months of August and January. Of two companies losing 75 men during a voyage of eleven months, 40 of them from "fever," probably typhus, 18 from dysentery, and the remainder from scurvy and cachexy. The Second Battalion of the 42d Regiment suffered a loss of 5 officers, and 116 men between England and Calcutta. Let the above examples, out of many, suffice. It is well that we should occasionally look back on such facts and figures, and compare them with those of our own time: they serve to mark progress, and should stimulate us to fresh exertion. By way of contrast then let me invite your attention to the fact that when the mutiny of the Bengal Sepoys called for the presence of a large European force to suppress it, regiment after regiment was landed in Calcutta, in by far the majority of instances, without a death by the way.

After voyages such as I have indicated, in duration so extended, and under sanitation so defective, it will not surprise you to learn that the soldier was too often landed in a deteriorated state of health—in a more or less scorbutic condition, and consequently ill able to resist the disease-producing agents to which he was at

once subjected. Arrived in India he was too often quartered in stations of proved insalubrity—stations selected, in most cases, without reference to questions of health; military and political considerations of real, often of merely supposed urgency, alone governing the selection. The barracks were placed with a like disregard to the health of the inmates, in unsuitable places, on unsuitable soil, in a word, with total disregard to all that we comprise under the word climate. The buildings themselves were often ill-contrived, ill-ventilated, almost always overcrowded. I have seen 1200 men quartered in barracks originally intended for 700. The latrines were almost invariably in the wrong place, imperfectly flushed, a privy atmosphere often prevailing in certain ranges, invariably giving a much larger proportion of cases of diarrhoea, dysentery, cholera, and what is now recognised, but was not then, enteric fever. Surface drainage in the neighbourhood of the barracks was usually most imperfect; subsoil drainage mostly never thought of. The water supply, to this day a great difficulty in India, was in the olden time hardly recognised as a source of disease at all, and was often, indeed almost always, to put it mildly, *bad*. The food of the soldier was ill-suited to the climate, monotonous, excessive in nitrogenous ingredients, ill-cooked, greasy curries being the most common form—a fertile source of diarrhoea, particularly in young soldiers, and of hepatic disorders among those of all ages. It is impossible to exaggerate the extent to which intemperance prevailed, or the amount of disease to which, directly and indirectly,

it led ; the liquor consumed being often of a peculiarly pernicious kind. It is needless to add that sexual excesses contributed, then as now, with all that impurity brings in its train, to swell the amount of sickness, mortality, and invaliding. Until a comparatively recent time in the history of the European army in India, the system of dressing and accoutreing the English soldier was opposed to the plainest dictates of common sense ; within my own recollection he mounted guard in the hottest weather dressed very much as if he had been doing duty in a Canadian winter, less, of course, his greatcoat, and as for his head-gear, I have, as I have elsewhere said, seen at least half a dozen different forms of chako "dance into the light and die into the shade," the last more ingeniously contrived even than the first, to concentrate the sun's rays on the crown of the head, as if the intention of the inventor had been to promote insolation, too often followed by a successful result. I cannot resist pausing for a moment to notice, what you must often have done as you passed, in your walks through London, some of our official buildings, particularly those belonging to the military departments. There, in the bitterest days of our winter, are to be seen men shivering on sentry duty in their tunics, while their comrades off duty are walking about comfortably in their greatcoats. Or, what is still more curious, we can any day see some of the finest-looking soldiers the world can show, sitting motionless on their horses, in the same weather, alike unprotected, with a brightly polished cuirass on their chests to carry off briskly into space

what of animal heat the winter wind has left, while, perhaps, a mounted trooper on ordinary duty of some kind, duly protected, is to be seen trotting comfortably past. Yet I often hear people wonder why the household troops suffer with exceptional severity from destructive lung diseases? It is not in India only that some lessons are wanted on this subject; "smartness" in winter weather should surely give place on so vital a point as this.

Returning to what concerns us here to-day, I have to show you that it is only in recent years, say within the last thirty, that attention was paid to season in the movement of troops, which often took place during the rainy season, or in the fervent heat of the Indian dog-days. It is hard to say which was the most destructive or caused the greatest amount of suffering. Let me give you an example, more likely to impress you than a vague general statement, sure to "go in at one ear, and out at the other." Within my own recollection the following tragical occurrence took place. A distinguished General officer arrived in Madras to take the command of the army of that Presidency. It so happened that the regiment he commanded in Spain, under Wellington, and with whose history his own was imperishably associated, was shortly expected to arrive within the limits of his command. Not unnaturally he was anxious to secure for his old regiment the best station in the Presidency. Having ascertained this, he gave orders that the regiment, then occupying the station reputed the best, should, on the arrival of his own, be marched

to one in a distant part of the Presidency. The officers of the local staff pointed out that to carry out this order would doom the regiment to destruction, as the monsoon was on the point of bursting. To this the commander-in-chief would not listen; he had never served in India, knew nothing of its climate, and thought that British soldiers should be ready to go anywhere and do anything. The march took place. At the end of it the regiment was inspected by Inspector-General Donald Macleod (an old Peninsular companion of the commander-in-chief), who reported that barely 100 men were fit to bear arms. Transport ships were taken up, and the miserable remains of this once fine regiment was sent to cruise in the Bay of Bengal, to "recover" their health. It was my fortune to see this regiment in Lower Burma soon after it had been made up to its former strength by drafts from England. The late Dr. Parkes saw it also, and very well knew the sad episode in its history I have just related. Drills and military exercises were often carried on in like manner in defiance of climatic conditions, and sometimes in the face of terrible examples of evil consequences resulting. Just before my arrival in India, a General officer met with a fatal accident. What took place on the occasion of that officer's funeral is a tradition in that part of India to this day. The parade took place in heavy marching order, the men having as head-gear one of the ray-traps already referred to, made after the pattern of the one I now show you. Before the sun rose next day seventeen men were in the dead-house struck down by insolation. Can we wonder

that the death-rate and terrible amount of invaliding revealed by the Royal Commission in the European part of the army of India, startled the conscience of the nation, and roused the authorities to the necessity of sanitary reform in the widest sense of the term. I must not pass from this painful part of my subject without touching on another point. In the pre-sanitary age little was done, at all events in a general and systematic way, to raise the moral tone of the soldier by the establishment of reading and recreation rooms, and to wean him from vice and debauchery by other means than a harsh and unsympathetic discipline. It is unpleasant to recall the frequency and severity with which the lash was used to punish "crimes" and breaches of military discipline, that would, in the present day, be thought adequately punished by some days' confinement to barracks, or at most to the solitary cells.

The financial aspect of this state of matters did not escape the attention of the Royal Commissioners, and it is well you should have it brought before you, to deepen the impression it is my object to make on your minds on your first entry on the study of military medicine. The cost of a regiment in India, when every item has been brought into the account, they reckoned at the great sum of £100,000, and the money value of a man at £100. Without going into details, I may say that they calculated the cost of sickness to the State, at the rate they make out in their Report, to be £588,000 annually. Deducting £200,000 for sickness assumed to be inevitable, and £388,000 remain.

Turning now for a brief time to the first effects of the great sanitary movement to which I have just referred. This is often spoken of as if it was entirely due to the labours of the Royal Commission to which I have so often referred. If you will turn to the evidence taken before this commission, you will find abundant proof that their recommendations, which have been so fruitful, were for the most part based on knowledge supplied by the medical and other officers of both armies—knowledge which had been for many years available if those in power had sufficiently appreciated its value and carried it into practice. This statement, which does no injustice to the Royal Commissioners, is due to those who were long the unheeded promoters of sanitary reform. The splendid results which have followed this reform were brought about in the main by a reversal of the system it has been my duty to explain to you.

Troops are now sent to India at proper seasons of the year in steamships expressly built and fitted for the purpose. They are housed in better barracks, without overcrowding, and properly ventilated; and health considerations in most cases are allowed due weight in the selection of site. As already said, a proper water supply is one of the greatest obstacles in the way of health in India. It is very difficult to obtain it, particularly when troops are quartered in or near the great centres of population, where the soil has become sodden with faecal impurities. As a rule no pains are spared by engineer and medical officers to secure the best available, and to use the best known means for its purification. There is

no part of a medical officer's duty of more importance than to keep a watchful eye over the water supply for the men committed to his care. The latrines, already shown to have been in the olden time such fertile sources of disease, are now better placed, and the dry-earth system has everywhere superseded that of imperfect flushing. It has, however, been lately established that the good effects of this system may be vitiated if the vessels in use for the solid deposits are unglazed. Such vessels become in time saturated with decomposed matter, give out an abominable odour, and become sources of disease. The point, trifling as it may appear, is worth your attention. The diet of the soldier in India is better attended to ; is less monotonous, of better quality, and better cooked. His clothing is now infinitely better adapted to the climate, and his head is protected by a helmet better suited for the purpose. I cannot refrain from mentioning a fact recently brought to my notice by a medical brother officer. In one of the actions with the mutineers a cavalry soldier, whose hard fate it was to wear a huge brass helmet, was brought to the field-operating tent with one leg below the knee smashed by grape-shot. In reply to a question as to the pain of a wound so serious as to demand immediate amputation, he replied, "Yes, sir, it *is* painful, very painful, but nothing to the horrible pain in my head from that thing," pointing to his brass helmet beside him.¹ The modern

¹ The present regulation helmet, although a great improvement on the old chako, is far from perfection ; it gives no protection to the temples, is badly shaped, and not properly ventilated. Many

system of accoutreing the soldier has been extended to India, to his immense comfort : an improvement mainly due to my late colleague, Professor Parkes, with which his name ought to be more associated than it ever has been. The temperance movement has made great progress in India. Total abstainers are now reckoned among our men by thousands ; and although I am far from saying that soldiers have ceased to carry with them to the East their national vice, as compared with what it was in my day, the improvement is very notable, and has been a powerful factor in diminishing disease and mortality. No better evidence of this gratifying fact can be adduced than this, which I give you on the authority of the paymaster of this hospital, that the money brought home from India by the invalids and time-expired men who pass through it, often amounts to between forty and fifty thousand pounds in an invaliding season. Much is now done to find wholesome recreation and employment for them by the establishment sometimes of workshops, and always of reading and other recreation rooms. Hill stations now exist where formerly unknown ; and as facilities for rapid movement and the concentration of troops, when required, become more and more established, it is probable that a longer part of the British soldier's service in India will be passed away from the

officers wear a small white skull-cap under their cork helmets, which, slight as it may appear as a protection, is found very effectual. The nearer the military authorities can be induced to approximate the head-gear of soldiers to that worn by sportsmen in India, the fewer will be the cases of sunstroke on service.

hot and malarious plains than is as yet possible. To the young soldier fresh from Europe this will be a great boon, and tend to diminish the sickness and death-rate from enteric fever, which is the scourge of the young and newly-arrived.

When climate-struck, the facilities for a return to their native land, for the non-commissioned officers and privates of the army, have been enormously extended. The same "first-class" transports that brought them to India take them home again, and on arrival they are received and cared for in the noble hospital in which we are assembled.

Of late years the death-rate among officers in India has been about 13 per 1000, closely approximating to that of the Civil Service. The mortality of the wives and children of soldiers has always been high. As a class the women are ignorant, slow to accommodate themselves to the new climatic conditions in which they are placed, and in the pre-sanitary age they were not so well cared for and instructed as they might have been. In 1871 the death-rate was 18.53 per 1000, including 2.45 per 1000 from cholera. In Madras it was 18.30 per 1000 from all causes. In Bombay it was 17.93 per 1000, no cholera in that year. As with the wives so with the children of British soldiers, the mortality has always been high, sometimes enormous; it has been recorded as reaching 83 per 1000, 94 per cent being under five years of age; the chief causes of mortality being convulsions, dentition anæmia, and atrophy, diseases for the most part due to the ignorance of

the mothers, more particularly in the all-important matter of diet. That this enormous mortality is not due merely to climate is conclusively proved by the statistics of the civil, military, and medical funds, which show that up to the age of seven years the mortality of European children in the class represented is much less than among children of the same class in Europe. And Sir Joseph Fayrer has shown, that although the Female Orphan Asylum in Calcutta is not very favourably placed as regards its sanitary surroundings, the mortality among its inmates is less than in similar institutions in Europe.

Let us now see the effect in the reduction of mortality, the outcome of the improvement in sanitation I have briefly summarised. I take the year 1871, about ten years after the introduction of measures of sanitary reform on a large scale, and because it was the first year in which the sanitary commissioner, with the Government of India, was able to include in his annual report the statistics for all India. The death-rate for all India in that year was 17.53 per 1000, the lowest, up to that date, ever attained. In the Bengal Presidency it was 17.83 per 1000, "just a trifle above that of the native army," which was 17.81 per 1000. Deducting a small mortality from cholera among British troops, the death-rate from all causes was 17.12 per 1000. Following the same authentic record, we find that the strength of the British army in India in that year was 56,806, the deaths amounted to 996, the invalids for discharge and change of air 2381, including those who died on

the homeward voyage, and in this hospital, the total loss by death and by discharge was 34.71 per 1000, just one-half of the loss by death alone in the pre-sanitary age. This was not all: in the year under notice the number of men "constantly sick" fell from 10 per cent to 5½ per cent of strength.

What are the diseases which injure the health and destroy the life of the British soldier in India? They are chiefly fevers, bowel complaints, diseases of the liver, and epidemic cholera. Turning again to the year 1871, the strength of the army being, as already mentioned, 56,806, and the total deaths 996, we find that 62 died from cholera, 99 from malarial fevers, 92 from enteric fever, 87 from phthisis, 39 from insolation, 96 from diseases of the heart and blood-vessels, 21 from pneumonia, 155 from liver diseases, and 76 from dysentery. The sanitary commissioner compares this death-rate with that of the same class at home, and the result is that respiratory diseases are less fatal in India; the mortality from heart disease is nearly the same in both countries; but the febrile group is sixfold more fatal in India than at home, while dysentery is 47, and hepatitis 227 times more fatal than at home.

The startling fact that enteric fever is the disease most fatal to young soldiers in India was brought to light by the late Dr. Bryden, statistical officer to the Government of India, an officer of whom it is not too much to say that he was one of the ablest vital statisticians the medical profession has ever produced. Until a comparatively recent time this disease was not clinically

differentiated in India. Just as in Europe it was confounded with typhus, until Jenner and Stewart established the diagnosis, so in India, cases of enteric fever were constantly mistaken for the adynamic form of remittent fever, and registered accordingly.

It was first diagnosed by Dr. Scriven of the Bengal army, by myself, and the late Dr. Barclay, then surgeon of the 43d Regiment, in Madras, about the same time; but it is mainly to the researches of Dr. Bryden that its great prevalence and fatality was placed on a sure statistical basis. The thread of malaria, with more or less of the type of periodicity it always induces, obscuring the diagnosis; the fact also that men dying of this disease, when their bodies were brought to the *post-mortem* table, almost invariably presented the well-known morbid appearances due to malarial poisoning, tended to mislead observers, and even to cause some to deny stoutly the existence of enteric fever at all in India. Has it ever been imported into that country from Europe? Surgeon-General Munro has placed on record an instructive example of this. His regiment, the 92d, took the disease on board ship when it embarked for India, suffered from it on the voyage, carried it up the Indus to its destination—the station of Jullundur, where it prevailed for some time. But, as already mentioned, it is mainly to Bryden we owe the fact that enteric fever is the scourge of young soldiers in the first year of their Indian service, and that it is mainly in the hot weather that they are prone to be attacked. Bryden was of opinion that the disease can arise spontaneously, without

the application to the system of a poison elaborated in the persons of men previously affected; although he admits that a zymotic element is generated when enteric fever is so developed.

In 1871, the year, under the guidance of the sanitary commissioner, we are passing in review, the admissions for intermittent fever were 21,174, for remittent 1648, for continued and ephemeral fevers, under which head I suspect many slight cases of undiagnosed enteric were included, 7230, and recognised enteric 207. In all, from this class, 30,259 admissions out of a total number of 82,345, 460 men being constantly in hospital from fevers.

It is impossible to give in figures any adequate notion of the extent to which the abuse of alcohol in India has tended, directly and indirectly, to swell the amount of sickness, mortality, and invaliding. It will throw little light on this painful subject to say, that in the year under notice there were 125 admissions and 9 deaths from delirium tremens. No figures can show the effects of this potent disease factor. My experience leads me to point to the fact that in 1871 3700 men were admitted into hospital under the head of hepatitis, with 155 deaths, as strong evidence of the baneful influence of strong drink in a hot climate. In India, as at home, venereal diseases swell the sick returns; 458 men were constantly in hospital from this cause. It is needless to remind you that out of the total admissions, 11,179, a certain proportion from the secondary forms of this disease must inevitably have become permanently inefficient.

I have thus, gentlemen, as far as the time at my disposal for the purpose admitted, given you, as it were, a bird's-eye view of this part of the subject. Before I conclude I wish you to understand that the unfortunate antagonism to which I referred in the early part of this lecture, as existing between military and medical authority on questions of health has been almost entirely removed. In accordance with a wise recommendation of the Royal Commissioners, medical officers are no longer restricted to the cure of disease. They are not only allowed but are enjoined to advise on its prevention, as perhaps the most important part of their duty. But you must understand that commanding officers are not, by the rules of the service, obliged to follow the advice given. When a senior medical officer tenders advice on an important point of sanitation, if the officer in command does not see fit to comply with the advice given, if that advice does not commend itself to his judgment, or cannot for good military reasons be carried out, the authorities direct him to place his reasons in writing for his refusal, and the responsibility of the medical officer ceases.

And here, gentlemen, let me at this, the very outset of your military life, advise you to be most circumspect in this matter of advice, at all times, but more particularly in the early years of your career, when as yet your personal experience is small. Let me urge you to apply your minds during your brief stay here to learn "how to advise." That is one of the reasons why you are sent here. Some would-be advisers of young army medical men try to persuade them that when they leave the civil

schools they are fully equipped for all that is before them in military life. Gentlemen, believe me, this is a mistake ; if with such a notion in your heads you enter on your duties despising what is taught here, your first interview with a commanding officer of knowledge and experience when you appear before him as an adviser on a matter of health, will painfully undeceive you. Modern soldiers are not all ignorant, as many of those of the old school were, of the elements of sanitary science, and some, you will find, have Parkes' *Elements of Hygiene* at their finger ends, as ignorant and presumptuous advisers will soon find out to their confusion. This, gentlemen, is a word to the wise. Above all, let me urge you, when you approach those who have the responsibility of military command on their shoulders, particularly in the early days of your service, not to do so (excuse the familiar but expressive word) "*bumptiously*," but rather modestly, and only after you have carefully considered the subject in all its bearings. When you have to put your advice in writing be doubly circumspect, "*litera scripta manet*." Remember, it has to be submitted to a man of education, of experience, of knowledge of his work, and of the world ; and be assured, if your letter, memorandum, or whatever shape it may have, is not so written as to carry on its face evidence that it proceeds from the pen of an educated gentleman, it will count for little in the estimation of the officials into whose hands it may pass.

LECTURE II

MALARIA

BEFORE entering on the subject of the class of fevers known as malarial, it is necessary to say a few words on the poison to which they are supposed to owe their origin, and from which they take their name. To this agent the name of malaria has long been given—in the present state of knowledge a sufficiently convenient term, although it implies an hypothesis.

Let me first deal with the latest opinion put forth by men of science as to the real nature of the supposed cause of the class of fevers known as malarial. According to Professors Tommasi Crudeli of Rome, and Klebs of Prague, these fevers are not due to a malaria or fever-generating agent proceeding from marshes. In the year 1870 they examined the lower *strata* of the atmosphere in the *Agro Romano*, as well as the soil and water of that region so notorious for fevers of the intermittent and remittent type. In the two former they discovered “a microscopic fungus, consisting of numerous movable shining spores of a longish oval shape, and nine micromillimetres in diameter. This fungus was

artificially generated in various kinds of soil; the fluid matter thus obtained was filtered and washed, and the residuum left after filtration was introduced under the skin of healthy dogs. The same thing was done with the firm microscopical particles obtained by washing large quantities of the surface soil." According to the learned authors the animals so treated went through all the phenomena of a typical case of intermittent fever; showing precisely the same acute enlargement of the spleen as human patients who have caught the disease in the ordinary way, and in their spleens the characteristic form of fungus was found. As this fungus grows in the shape of small rods, the discoverers gave it the name of *Bacillus malarie*, and declared their belief that the class of fevers hitherto supposed to be due to a bad air soil-produced, was due to this bacillus. Two physicians, practising in Rome, viz. Drs. Marchiafava, and Valenti, announce that they have detected this bacillus in human patients in a more advanced stage than in the animals experimented on by Tommasi Crudeli and Klebs. In the article "Malaria," contributed by me to Dr. Richard Quain's *Dictionary of Medicine*, in addition to the above particulars, given in greater detail, you will find the following passage: "Dr. Crudeli still more recently states, as the result of further pathological investigations, that the bacilli may always be found in the blood during the period of invasion of the fever; but that during the acme they disappear, and spores only can be discovered. The bacilli have been found chiefly in the spleen of the human subject, and in the

marrow of bones in animals experimented on. The bacillus has not yet been found in India. According to the researches of Laveran, extended and corrected by Richard, the blood in malarial fever contains, during the accession, spherical organisms, developed in connection with the red corpuscles, and furnished with filaments; also certain curved and pointed bodies, which are only infected and deformed corpuscles. The pigment granules of malarial blood are produced in the red corpuscles during the growth of the organisms" (*Lancet*, 1882, vol. i. p. 993). Should future observations by independent observers in other malarial regions confirm these conclusions, it would be difficult to overrate their importance.

In the years that have elapsed since the existence of the *Bacillus malarie* was brought to notice, this much-needed confirmation by independent observers in malarious regions has not been forthcoming. Very competent observers have looked for it in vain in the most malarious districts of Bengal. I do not doubt that a fungus exists such as the eminent men found in the soil of the *Agro Romano*, and in the spleens of men who have died from the pernicious form of fever there generated; but the question, Is it the cause of the fever? is not yet answered. It must be kept in mind that malarial fevers prevail in regions where the soil is widely different from that of the *Agro Romano*, in arid sandy districts, where it is difficult to believe that such a bacillus could find the conditions needful for its existence. As to its presence in the organs of those

dying of malarial fevers contracted in the regions where Drs. Tommasi Crudeli and Klebs made their observations, we must bear in mind that Professor Salisbury of the Medical College, Ohio, when he put forward the theory that malarial fevers were due to the introduction into the system of cells or spores emanating from certain species of algoid plants called *Palmellæ*, which are among the lowest known vegetable organisms, supported his opinion in the same way, by demonstrating the presence of these low vegetable forms in the urine and other secretions, and even in the organs of men who have died from ague. It is not disputed that he may have found what he describes, but the fatal fact remains, malarial fevers abound where no such vegetable forms are to be found.

In the present state of knowledge we must turn in another direction for an answer to the question, What is malaria? We cannot isolate this poison by direct experiment, it is too subtle for demonstration by the means known to chemistry; but the peculiar phenomena it induces on the living organism we do know. I have elsewhere defined the term to mean an earthborn poison, for the most part generated in soils the energies of which are not expended in the growth and sustenance of healthy vegetation. By almost universal consent it is the cause of all the types of intermittent and remittent fevers, and of the degeneration of the blood and tissues from long residence in regions where it is generated. The term malaria is preferable to that of marsh miasm, which implies that the poison is only produced in marshes.

This poison is almost everywhere present in India. Dr. Parkes has well said that when a climate is said to be unhealthy, it means that it is malarious. It is everywhere most intense in its action in low, warm, and moist places, where there is rank vegetation and water. As I have already indicated, it also sometimes shows its presence in warm climates at certain seasons, when some of the above conditions are absent. In such cases either organic matter will be found to exist in the youngest strata of the soil, or, where water in the sub-soil is detained by a bed of clay, both conditions may and sometimes do coexist. It is an old observation that marshes are not, as a rule, dangerous when abundantly covered with water, but when the water level is lowered, and the soil is exposed to the sun, malaria is given off in abundance.

One of the best examples I can give you of the genesis of malaria on a large scale is what occurred in the district of Burdwan some years ago. This district is reputed to be more healthy than the central or eastern districts of the Gangetic delta. The soil is alluvial, but dry. The drainage of the district was obstructed by the silting up of its natural outlets, the soil became waterlogged, with the result of an immense development of malaria, and an alarming increase of sickness and mortality from fever. The way in which malaria is generated in a destructive form under different conditions can best be shown by the experience of Wellington's army when operating in Estremadura. The country was so arid and dry from want of rain that

the river-beds and water-courses were reduced to mere lines of widely-separated pools; yet, as Dr. Ferguson records, the army suffered from a remittent fever of such malignancy as to threaten its destruction. The same thing happened to the army in the bare open country by which Ciudad Rodrigo is approached from the side of Portugal, at a time when the country resembled a brick-field. The explanation is to be found in the fact that both districts are in the rainy season flooded with water, the malaria being given off only when the drying process begins under the action of a powerful sun.

The natives of India, not without good reason, believe that the poison of malaria is often conveyed into the system by water; being generated by the decomposition of vegetable matter in ill-kept and neglected wells. We send our patients from one place to another for "change of air," they do this to "change the water." There is no place in the world with a worse reputation for malaria and all that it brings in its train than the Roman Campagna. To all appearance it is free from the commonly recognised sources of malaria; but the cultivating hand of man has long been withheld from its rich soil, the energies of which, no longer turned to food-producing ends, are given up to the development of malaria. Recent discoveries have disclosed the interesting fact that the Romans were not ignorant of the importance of subsoil drainage as a corrective of malaria; the remains of a regular system of pipes for the purpose having been brought to light. In the absence of this

system, the indispensable factor, viz. stagnant subsoil water is again there in abundance, hence the malaria, disease, and death for which the Campagna has such an evil reputation.

Some rocks in a state of disintegration, when freely exposed to the drying action of the sun and air, are often in hot climates highly malarious. The best example of this that has come under my observation is a most instructive one. Before the island of Hong-Kong was ceded to the British Government, it was temporarily occupied by the troops then operating against China in our first war with that country, on the site on which now stands the city of Victoria. They enjoyed good health. Immediately after the cession excavations on an extensive scale for building purposes began. At once it became frightfully unhealthy, from a form of remittent fever of great malignancy. The soil was composed of granite in such a state of disintegration that it crumbled under the fingers; it contained about 2 per cent of water, and according to Friedell, quoted by Parkes, was permeated by a fungus. I well remember the following painful occurrence. A small house was occupied by some artillery officers; one of them, a young and inexperienced subaltern, impatient of the want of space behind the house, had the side of the hill scarpd away, exposing a considerable surface of the soil. The result was that all the inmates of the house were at once struck down by the prevailing fever, and the young officer, the unconscious author of the mischief, fell a victim to it. Even in Europe, soil long left fallow often gives off malaria

when disturbed. Thus in 1811, when the S. Martin Canal in Paris was being excavated, an epidemic of intermittent fever prevailed in the quarters of the Temple, and others in the line of the excavations. Again in 1840, when the fortifications of the city were being erected, the same thing took place; and so late as the second empire, when the new streets and boulevards were constructed under the *régime* of Baron Hauserman, intermittent fever again appeared among those exposed to emanations from the soil. It is needless to add that in tropical climates this is a common occurrence.

Malarial fevers are sometimes seen on board ships at sea, and as I have elsewhere shown (article "Malaria" in Quain's *Dictionary of Medicine*) can be thus explained: (a) the sufferers may have had their systems charged with malaria before embarkation; (b) they may have used water on board drawn from a malarious locality; (c) the source of the malaria may be in the ship, from decayed vegetable matter mingling with the bilge water, in ships under a bad sanitary *régime*; or (d) it may arise from malarious mud, as in the case of H.M. ship *Powerful*, returning from India, when a severe outbreak of fever was traced to this cause. I am indebted to the late Dr. Mansfield, R.N., for an instructive example of a fatal form of yellow malarial fever on board H.M. ship *Egmont*, long used as a store-ship at Rio. The ship was found to be in a state of decay, and the timbers were permeated by fungi of large size, of a white or cream colour, giving off a sickening and offensive odour.

Temperature exercises a powerful influence on the

development of malaria. Many places are safe in winter which give off the poison freely in summer. Wenzel has investigated the effects of temperature by exact observations for a period of twelve years, made during the construction of the fortified port of Jahde, a very malarious locality. He shows that the increase in the number of malarial attacks was coincident with a rise in the temperature. In the diagrams of temperature and sickness constructed by him, there is a constant precedence of the temperature curve by 20 or 25 days to the sickness curve of attacks; so that three weeks of increased temperature appeared to be the period necessary for the production of the malarial poison and an outbreak of sickness. These observations were made in a temperate climate. In regions where a high temperature is more quickly developed the poison would be sooner given off and its effects would be more rapidly seen. In any year when the medium summer temperature did not reach 12° R. (59° F.) the sickness remained at its minimum.

Malaria abounds at the base of all mountain ranges in India. That belt of country at the base of the Himalayas, known as the Terrai, is notorious at certain seasons for its insalubrity. The soil consists of a vast accumulation of organic matter, the subsoil being charged with water from the mountain streams.

As has been already said, chemistry has not thrown much light on the nature of malaria, certainly not on its power to act deleteriously on the human system. The air of marshes contains watery vapour and carbonic acid

in excess, and, under certain conditions, sulphuretted hydrogen; carbonated hydrogen is also present, and occasionally free hydrogen and ammonia, and, it is said, phosphuretted hydrogen and the debris of animal and vegetable life (Parkes). It is capable of drifting along plains to a considerable distance from its source, particularly in the direction of the prevailing wind. Italian writers constantly refer to an example of this recorded by Lancisi. Thirty inhabitants of Rome were walking towards the mouth of the Tiber; suddenly the wind arose, blowing towards them from the swamps of that region. Twenty-nine of them were attacked with intermittent fever. Examples of this kind could be multiplied indefinitely; the fact is notorious in all malarious regions. It ascends mountains when favoured by ravines and currents of heated air, a point of great importance. I could give you many examples of the ill effects of placing human habitations near the edge of such ravines on mountain ranges of great elevation, where the inmates have suffered severely from malarial fevers. The height to which malaria can ascend from its source is a matter of dispute. Parkes thought that 500 feet is the limit in temperate climates, and 1000 to 5000 in warmer regions. I have, however, known men to suffer malarial fevers at a height of more than 5000 feet above the heated plains, whose habitations, were placed as above stated on the edge of ravines up which malaria ascended with the currents of warm air from below. M. Leon Colin, a French military physician of great eminence, who studied this sub-

ject with care during the French occupation of Rome, does not use the term malaria to express the poison that generates periodic fevers. He prefers the term telluric poison (*intoxication telluric*) proceeding from the vegetative energy of the soil, when that energy is not taken up by its natural consumers, crops or plants, in a word, healthy vegetation. This "telluric poison" is only, after all, a *malaria*, a bad or poisonous air generated in the soil, under another name. What M. Leon Colin is most anxious to insist on is the point I have already pressed on your attention, viz. that merely marshy vapour is not the only source of so-called malarial fevers, for they are found in the Sahara and in Algeria, where there are no marshes to exhale nor surface vegetation to putresce. This is indisputably true in India, where soils long left uncultivated and far from marshes are often unhealthy, and invariably so when freshly exposed to the air, until their vegetative energy is turned to the growth of crops under the cultivating hand of man.

We must not forget that this powerful poison was once nearly as prevalent in Great Britain as it is at this day in Bengal, and was the prolific mother of the same class of fevers which prevail where it exercises sway. It is banished from our soil by ages of cultivation, drainage, and more particularly subsoil drainage, but it still lingers in places where these measures are imperfectly carried out. Historians tell us that when from political causes extensive tracts of country in England have been thrown out of cultivation in the then undrained condition of the

subsoil, malarial fevers raged in an epidemic form and caused great mortality.

In India a progressive increase in the death-rate from this class of fevers extending over years is occasionally noted by the sanitary commissioners. Thus Dr. Cornish records that since the year 1868 there was a progressive increase in the death-rate from fevers in the Madras Presidency, rising from 105,692 in that year to 192,469 in 1871. And the same careful sanitary authority noted a well-marked movement southwards in the same Presidency of what he terms a "malarial wave," proceeding from the northern districts of Ganjam, Vizagapatam, and Godavery, towards Salem in the south. In the last-named district the death-rate from fevers in 1868 was 105,692, in 1871 it rose to 19,501. Mr. Cornish has placed on record a fact to which I have often referred in this lecture-room, and which I mention once more to impress on your minds the importance of the subject to which this lecture has been devoted. It is this: the year 1869 was a year of severe cholera in an epidemic form, causing a heavy mortality, yet for every death from that disease 23 took place from malarial fevers.

Of course there are numbers of our profession who do not accept the doctrine of the existence of such a poison as malaria at all; as I have said in the article to which I have more than once referred, "Those who deny its existence have a difficult thesis to maintain." To Dr. Oldham "chill," to Dr. Munro "certain electrical conditions," explain the grave effects commonly attributed

to malaria. Once more to quote my own words, "If chill will account for the loss of 10,000 men at Walcheren, for the frightful disaster of a like kind at Carthagen, for the terrible mortality from paroxysmal fevers at the Mauritius, and countless examples of the same kind elsewhere, and for the yearly loss of life in India from fevers—the country in which Dr. Oldham serves, why, seeing that mankind are exposed to 'chill' everywhere, are not such fevers with their sequels universal in their prevalence, instead of being confined to places under one or other of the conditions described in this article? Why, above all, in a country like Great Britain, where vast multitudes of the population are hourly exposed to every variety of atmospheric change, have paroxysmal fevers, once endemic there, disappeared, save in such exceptional places as are still under one or other of the conditions described above?" No satisfactory answer has been given to this question. As for "the electrical conditions" of the other hypothesis, when its author can explain what these conditions are, and why they no longer exist in the British Islands, or do not produce their usual effects, we shall be prepared to discuss their value from a pathological point of view.

There is no fact in pathology more familiar to those who have practised in malarial climates than this, that the human constitution can be silently undermined by malaria, without the manifestations of febrile phenomena sufficiently marked to attract the attention of the sufferer. In such regions the children of those affected by the malarial cachexy are often born with the peculiar tint of

skin characteristic of the affection, and also with enlargements of the liver and spleen; changes brought about in the womb, as we see in the children of syphilitic parents. Trousseau has observed this to occur in some of the malarious parts of France. It is capable of giving a type of periodicity to almost all diseases, even to such affections as pneumonia and pleurisy, and the irritative fever succeeding surgical operations and severe injuries. Practitioners in the Southern States of America have noted this, and it is yearly seen in this hospital among our invalids from India. It is doubtful whether the human system once saturated with this poison ever really gets rid of it. Certain it is that those who have long been victims to ague are liable to suffer from their old enemy, years after they have been removed from fresh exposure to the cause of their ailment. Agues are not always developed at the time and in the country where the poison was taken into the system. Men coming here from malarious countries sometimes have their first attack of intermittent fever in this house. Examine such men, and you will see that they bear in their bodies evidence of the malarial cachexy in the tinge of their skins, and their enlarged livers and spleens.

In all true malarial fevers there is from the first great disturbance of the stomach, and in severe remittents this is generally the most troublesome symptom. In that fatal form of the disease to which Continental writers give the name "pernicious," morbid appearances in the stomach are invariably found to be the chief lesion.

Of all the structural changes brought about by this poison the most common is enlargement of the spleen, the "ague cake" of the Fens. You have specimens on the table showing this enlargement in every degree. I invite your attention in particular to the enormous example of this enlargement in this jar. It was taken from the body of a small drummer-boy, the greater part of whose short life was spent in the Peshawur Valley. Its weight was 10 lbs. 15 ounces, its length is 14 inches, breadth $7\frac{6}{10}$ inches, and $4\frac{9}{10}$ inches in thickness. Its increase was due to connective tissue. In men dying from the more acute forms of fever the spleen is often found to present the appearance of a mere bag of blood. In India fatal occurrences are often the subject of judicial inquiry from blows thoughtlessly inflicted on natives whose spleens are in this condition. The spleen swells and enlarges not only under the stimulus of the malarial poison, but also in enteric fever, and in most other affections in which noxious matters have been taken into the blood. In fact, as Vichow long since demonstrated, every considerable irritation of a gland results in an increased formation of cells in it, and in proportion to the extent of such irritation we see the colourless elements of the blood also increase. Under the influence of the malarial poison the organ undergoes also changes in colour. Sometimes it becomes of the colour of port wine lees; again we find it of a slate colour, and on section almost invariably deeply pigmented.

The liver also enlarges, being congested with dark

coloured and tenacious blood. The colour varies according to the degree of this congestion, and to the length of time from which the patient has suffered from the poison and the fevers it causes ; the tint varies from different shades of red to a slatish colour, the tissue being soft, easily torn, and always pigmented.

The result of these visceral enlargements, when excessive, is obstruction of the portal circulation and the passage of blood through the *venu cava*, with effusion into the peritoneal cavity.

Of all the morbid effects of malaria the most common is pigmentation, derived from the colouring matter of the blood, which escapes and infiltrates the liver, spleen, and sometimes the brain. The hæmoglobin becoming converted into hæmatodin ; anæmia is a common sequel of malarious poisoning ; you see it among our invalids here in every degree. The suddenness with which this takes place is often quite startling ; this was observed by our army medical officers to be a notable feature in an outbreak of malarious fever in the Mauritius some fifteen years ago. The skin becomes of a dirty pale brownish hue. This change is not icteric in its origin ; it is the outcome of the spleen and liver changes already described. The number of red globules diminishes sometimes to the extent of 75 per cent, they lose much of their red colour and their spherical shape, are slow to gather into *rouleaus*, and their edges become serrated.

Professor Kelsch, of the military hospital Val-de-Grace, has made blood changes in malarious fevers the subject of special study ; following for this purpose the

method of Malassez, by which the blood globules in a given quantity of blood can be counted under the microscope. By this method, Professor Kelsch, in a case of ague carefully observed, satisfied himself that in 24 hours his patient lost more than a million of globules per millimètre cube. In prolonged fever and in cachectic cases, the loss, according to the same author, is much greater. In less than a month the globules fall from five millions to a million and a half or less per millimètre cube (*Edinburgh Medical Journal*). Neuralgias are common sequels of malaria, brow-ache and hemicrania are familiar examples.

When the condition of the blood is as above described palpitation of the heart is rarely absent. Albuminuria is a symptom that often gives rise to much needless alarm. In former years I have sent officers home with the gravest possible prognosis, on account of the presence of albumen in the urine, with a dropsical condition of the lower extremities. This condition of things rarely alarms me now. We see it often here, and as a rule it passes away under the improved condition of the patient's blood and general health, brought about by judicious treatment, good food, and pure air.

Diarrhoea is easily excited in malaria-struck men, and it is needless to add that scurvy is a formidable complication of this cachexy.

The late Mr. Cutchliff, of the Bengal army, brought forward some evidence to prove that in some low swampy malarious districts in India, impotency prevailed, which is an additional reason why in places

much scourged by this poison population becomes sparse.

I have said much to you on the subject of malaria, more perhaps than some of you may think necessary ; but before passing from a subject of such paramount importance let me clinch what I have said. In 1804 this country sent an army of 36,481 rank and file to Walcheren. Fifty days after landing nearly 10,000 men were in hospital with malarial fever—from 25 to 80 men died daily. At this rate, if the force had remained 250 days on the island, it would have been exterminated. Even after it was evacuated 36,000 men went into hospital with disease, the seeds of which were planted there. I have already asked the question, Will Dr. Oldham's theory of "chill" account for this horrible destruction? Once more, the Italian War Office has looked into the financial aspect of malaria, as it concerns the army of Italy, the charge amounts yearly to £400,000. "No part of Italy can be traversed without the signs of this destructive agency to take the sweetness out of life, and to bring continually near the shadow of death. Not merely does it here and there peremptorily curtail the field of industry; everywhere it threatens the labourer and saddens his life."

LECTURE III

INTERMITTENT FEVER

WE have now to consider the remarkable forms of fever to which the poison of malaria gives rise. This fever then is one of malarial origin, characterised by the sudden rise of temperature during the paroxysm ; by the equally sudden fall at its termination, and by the regularity of the times of accession and apyrexia.

In the preceding lecture the morbid effects of the action of malaria on the solids and fluids have been so fully described that repetition is not needed.

Premonitory Symptoms.—As in other fevers so in this, the febrile attack is preceded by symptoms which herald the coming paroxysm. These are pain in the back and lower limbs, loss of appetite, languor, lassitude, gastric irritation, with nausea, and sometimes vomiting, particularly if the stomach is at the time loaded by a full meal, and sometimes urinary irritation, with frequent calls to micturate ; the sufferer passing small quantities at a time of pale coloured and highly acid urine, giving rise to much distress. Then follow in succession the well-known phenomena : first, of the so-called cold or

shivering stage, succeeded by the hot, which in its turn gives way to the last or sweating stage. When this passes away a period of apyrexia succeeds, which lasts for 24, 48, or 72 hours, when the same phenomena recur. The first is the quotidian, the second the tertian, and the last the quartan type of the fever. The quotidian is the most common, the quartan the rarest of all. The statistics for the three Presidencies of India show this, and the same rule seems to hold everywhere; thus, in the army of the United States in their great war, out of 98,237 cases of intermittent fever, 51,602 were quotidian, 44,875 were tertian, and only 1757 were of the quartan type.

All the world over a quartan ague has been noted as the most obstinate. It is certain that in India the first attacks are almost invariably quotidian. What is it that determines the difference? I do not pretend to know. It may be, as has been suggested, that the difference depends on the extent to which the system is charged with the poison, the quotidian indicating the highest degree of saturation, exciting a more frequent disturbance of the system. During the apyrexial interval patients are said to be "well;" this, however, is true only in a comparative degree, for there is often, and in first attacks almost always, a certain amount of *malaise* and general discomfort, indicative of the existence in the system of a poison which previous paroxysms have failed to eliminate or destroy.

Let us look more closely at the phenomena of the different stages. We find that after a longer or shorter

continuance of the premonitory symptoms, the patient experiences a sense of coldness in the back and limbs, gradually felt all over the body, soon he shivers, rigors rapidly succeed each other; the skin shrivels, the nails become blue, and in the warmest climate he desires to be warmly covered, and is in a state of extreme discomfort. This feeling of cold is only a "subjective symptom." The skin, from contraction of the superficial vessels, is indeed colder than natural, but the clinical thermometer, in the mouth or rectum, will at once indicate a rise in the temperature of from two to three degrees, and this even before rigors set in. The phenomena of the cold stage then are gastric irritation, a foul tongue, nausea, a rapid pulse, quickened respiration, and a sensation of extreme coldness, not confirmed by the thermometer. The characteristic of the temperature curve in intermittent fever is its sudden rise to a high pyrexial degree, and an equally rapid fall to the normal or rather a little below it, as soon as the sweating stage begins. This temperature curve is very characteristic. It has been shown by Wunderlich to occur in few diseases. This high authority on temperature in disease notes only the relapse into fever during convalescence from typhoid fever, the paroxysms of acute tuberculosis, and those of pyæmia. The cold stage varies in duration from half an hour to two hours. If protracted beyond this the case is one of severity. I have sometimes seen a prolonged cold stage caused by a load of indigestible food on the stomach, at once brought to an end by an emetic.

After a space of time varying in different cases the hot stage sets in, or, as it has been called, "the stage of equalisation of the circulation and chemical action." The patient feels warm all over, the bed-clothes are thrown aside, the face flushes, the pulse rises in volume, strength, and frequency, the skin becomes hot, the patient grows restless and complains of headache, with pain in back and limbs; the tongue is usually dry and bile-tinted, and the bowels are constipated. The temperature rises to 105° , 106° , and even to 107° , and so remains until the sweating begins.

Some American writers, familiar with the severer forms of the disease, dilate on the advantages of a "good hot stage," regarding powerful reaction as conducive to the patient's safety, whereas a quick and feeble pulse, with rapid thoracic respiration, and a low temperature, they justly regard as dangerous. This is the condition commonly seen in the victims to this fever in the most malarious parts of Italy, whose constitutions have been broken down by innumerable attacks; those who have had to treat the disease in the persons of Asiatics, under like conditions, are only too familiar with the description.

The paroxysm at last ends in the sweating stage, to the infinite relief of the sufferer. Beads of perspiration appear on the brow, and soon the patient sweats profusely—the pulse falls in frequency, the respiration becomes tranquil, the temperature steadily falls until it reaches some points of a degree below the normal. The average duration of a paroxysm is about six hours,

but it may extend to twelve. In first attacks the tongue is generally furred, and some degree of this will be noticed with the recurrence of the paroxysm. The saliva is invariably acid.

Urine.—As already stated, it contains a large amount of free acid, and it retains this acidity for some days even in the hottest weather. During the interval it is generally alkaline. When the paroxysms cease, the watery part of the urine diminishes. It assumes a deep orange colour, depositing urate of ammonia. Intelligent patients learn the significance of this sign, and often intimate to the physician that more quinine is not required. At the first elevation of temperature the urea increases (Parkes); this lasts during the cold and hot stages, then it decreases, falling below the healthy average. Colin and other French military authors note the enormous excretion of urea in malarial fevers both in Italy and Algeria.

Fevers of this type differ from others in an important particular: they are not communicable from person to person; the cause is not reproduced in the bodies of those affected. It is important to note with reference to the period of recurrence of the paroxysm, that in what may be called a *waxing* ague, that is before the person has been brought under the influence of remedies which break the regularity of the hour of attack, the cold stage on successive days will appear an appreciable time before the hour of first accession. The reverse is the case when the fever is *waning*, or when the patient has been to some extent brought under the influence of

quinine, the recurring paroxysm will appear perhaps an hour or more later.

TREATMENT.

There is no part of the duty of military and naval medical officers of more importance than the careful and conscientious management of young soldiers when first they are brought under the influence of malaria. It is a point of immense importance to their future health and efficiency that no pains should be spared to break the recurrence of the paroxysms as soon as possible. There is a tendency in the human system to repeat morbid phenomena by what, for want of a better name, we may call the force of habit. It may be, as some suppose, that a febrile paroxysm is the means by which the system is relieved of a certain part of the poison or ferment that is acting deleteriously on the red corpuscles throughout the whole extent of the circulatory system; but even so, few can doubt that every succeeding attack of fever is a step, long or short, towards those organic changes on which so much was said in a previous lecture, ending in that cachexy which finally unfits its victim for the active duties of life. The plan I have for years past urged on the attention of those who have preceded you on these benches, is not to lose sight of a young officer or soldier who returns to duty after a first attack of intermittent fever. I advise that such men should be kept on a special list, and that within a lunar month from the period of cure, they should be required to present them-

selves to have their systems fortified against another attack by being kept for some days under the influence either of quinine or arsenic. This last is one of the oldest known remedies against malarial fevers. Its power as a prophylactic is much insisted on by Professor Crudeli. Being slower in its action than quinine, it is less suited for the treatment of fever when actually present; but if judiciously used its power of strengthening the system against malaria cannot be doubted, and it has the advantage of being a cheap remedy, and what to most people is of more consequence, it is absolutely tasteless. To bring and keep the systems of young soldiers for some time after an attack of malarial fever, under the influence of arsenic, is a simple proceeding, which by a little trouble and arrangement can easily be carried out; by so doing I believe the power of resistance of the human organism to the assaults of malaria will be strengthened, to the advantage alike of the man and the State, whose costly servant he is. So much for medicinal prophylaxis, not the least important part of dealing successfully with the class of fevers under consideration.

There is no drug capable of arresting the stages of an intermittent fever once it has entered on the first or cold stage. As I have elsewhere put it (*Quain's Dictionary*), there is little to be said as to the treatment of the stages of ague, they must take their course; the only interference called for is to supply the patient with the covering he so much desires during the cold stage; and if this be protracted unduly, to give him draughts of

warm tea, and should symptoms of collapse appear, more particularly in men debilitated by disease, and in Asiatics, to administer such restoratives and stimulants as the case may demand. It is needless to say that the time-honoured practice of administering an emetic at the onset of the cold stage, is more "honoured in the breach than the observance"; an exception should be made when the stomach is loaded with a heavy meal. Digestion is arrested during the pyrexial period, and the system is relieved and the cold stage shortened by the action of a simple mustard emetic, aided by copious draughts of warm water. The great traveller Livingstone, who added medical knowledge to his qualifications as a missionary and explorer, and whose experience in malarial fevers was immense, began the treatment of all severe cases with the following combination: Resin of jalapand of rhubarb from 6 to 8 grains, with 4 grains of calomel, and a like quantity of quinine. According to the great traveller, and his hardly less experienced companion, the Rev. Horace Waller, this combination was found a very effective beginning of the treatment in cases both of intermittent and remittent fever. In Livingstone's camp the above pills were known as his "rousers," and were at once administered to men who from premonitory symptoms were observed to be "idle and lethargic." In about five hours copious dark coloured motions followed. If these were delayed, a brisk purgative enema was given. Quinine was then given in 4-grain doses every four hours until 12 grains were administered in the twelve hours succeeding the purgative medicine. Livingstone

and his followers deemed any other mode of dealing with the fevers of Africa to be "mere trifling." Common sense points to the necessity of caution in the use of such active purging in men debilitated by disease or climate, or both, or when the patients are delicate women, or Asiatics, often calling for as delicate handling. This sharp treatment is not applicable to those who are or have recently been suffering under any form of bowel-complaint. The effect of this purgation is not only to unload the bowels, but also to relieve the liver gorged with blood and bile. A very efficient purgative combination is from 3 to 5 grains each of calomel, extract of colocynth, and scammony, with a few drops of some aromatic oil, and 4 or 5 grains of quinine. The "interval" must be turned to the best account with the view to prevent the recurrence of a paroxysm. With this view, as soon as the sweating is over, 10 grains of quinine should be given, and repeated in five or six hours. I believe this to be the most effective and economical method of using the remedy. If the quinine is rejected and nausea and vomiting interfere with its use by the mouth, it can be given by enema in 4 ounces of beef tea, or in water, and in this way it is quite efficacious. It is not always that a paroxysm is prevented, but if not, it will certainly be observed to be less severe. And the above method must be persevered in until the desired result is obtained, and until the thermometer no longer indicates a rise in temperature at the time of expected attack. In cases where complications arise, it is in a high degree dangerous to pause in the adminis-

tration of quinine, or to use depressing remedies for this or that set of symptoms. Those who so act, in the graver forms of malarial fever, will have little success in dealing with them. Epilepsy, low forms of pneumonia, asthma, and bronchitis, may have to be met aided by support from proper food, and stimulants when called for. For years I have urged this point on the attention of those who have preceded you in this school, and I am glad to be able to enforce this lesson with the high authority of Trousseau. He says, "If, mistaking the nature of the phenomena, the physician is eager to combat the symptoms, the coma, convulsions, or delirium, by local or general bleeding, or by any other measure which is at least useless if it be not dangerous, he will, from the moment that calm begins to show itself, take credit for having obtained a fortunate result, which his ill-judged intervention has only not prevented; at the very time he is congratulating himself upon having achieved a success, the patient may be carried off by a paroxysm which might have been averted by appropriate treatment." What this great physician has said of the gravest forms of "pernicious" intermittent fever, is a hundred times more true of the remittent form, where such treatment as he has thus impressively condemned is fraught with danger. Surgeon-General Cornish, late Sanitary Commissioner of Madras, has shown how terribly the mortality among the natives of Southern India is aggravated by the system of starvation to which they invariably subject themselves when suffering from malarial fevers. Of all the complications to which I

have referred, the most common among Asiatics is a low form of pneumonia, and this is what is so fatal to them everywhere, but more particularly when serving in malarial climates, where the temperature is liable to greater diurnal variations than that of their own country. Surgeon-General Home, V.C., has done good service by the urgency with which he has directed the attention of medical men in India to scorbutus as a complication of this and other diseases; it should always be looked for and counteracted by appropriate treatment.

It is hardly necessary, after what has been said, to insist on support by nutritious diet, and, when called for, by the judicious use of stimulants of the best quality procurable. Livingstone and his followers used bitter ale in preference to all others, after the liver had been well acted on by the "rousers" of their leader. Other intelligent travellers in malarious countries are no less explicit on this point. Burton, than whom few men have faced more dangers from climate, advises "ye best wine in ye cellar," and poking a little fun at the dog-Latin of some of our prescriptions, he slily adds, "*non sine* tobacco if that can be enjoyed!"

Treatment of Malarial Cachexia.—On the first signs of this sad condition appearing, the patient should be sent to a non-malarial climate. Fortunately, in the present day a long sea-voyage is not necessary. Before it became the practice to send our invalided soldiers from India through the Suez Canal, few of them were landed at Netley free from scurvy. Even now it is a condition to be carefully looked for and treated when

discovered. A ration into which salt meat enters is poison to a malaria-struck man. Another point of supreme importance is the necessity of warm clothing. Mere "chill" will not originate an ague, but to a man saturated with malaria and whose abdominal organs are in the morbid condition I have described, chill may be fatal, not only by bringing on attacks of his old enemy, but something infinitely worse, viz. pneumonia of a fatal form. Some years ago an attempt was made to lessen the pressure on our space in this hospital during the summer time (which is often excessive, when, as often happens, five, and even seven, hundred invalids are admitted in one day) by sending invalids from India, so timed as to arrive here in the winter season, or, what is just as bad, in our ungenial spring. The result was most unfortunate. I have seen as many as five men landed with double pneumonia with which they were attacked on coming under the influence of our damp and cold climate. Not only was this the case, but men who had convalesced from dysentery on the voyage home, were again attacked by it, in a sub-acute form, and landed in a pitiable condition.

Sir Ranald Martin long ago called attention to the importance of proper clothing on return to a cold climate, but the lesson to this day is little acted on, and many suffer in consequence.

To a man charged with malaria pure country air in a healthy situation is the first requisite. Some late experience on the point has led me to think highly of a well-regulated system of *massage*, by a well-trained hand;

the effect of this, if steadily and skilfully done by an expert, is to diminish congestion of the abdominal organs, and to distribute the blood more equally through the system (a powerful aid to its depuration); to regulate the action of the bowels, without the need for aperient medicine; to remove the oppressive feeling of languor and lassitude; to promote cheerfulness and healthy action of the skin. I am aware of the difficulty of carrying out such a system as this in such an hospital as this, where our invalids are numbered by hundreds; but even here something of this kind could be done with advantage, if some of our orderlies were trained for the purpose. The various preparations of iron are clearly indicated. An excellent form is that known as Easton's Syrup, *Syrupus quiniæ et strychniæ phosphatis*, in doses of from one-half to a drachm, in a little glycerine and water. Each drachm contains one grain of the phosphate of iron, about one of the phosphate of quinine, and $\frac{1}{32}$ of the phosphate of strychnia. My colleague, Professor Aitken, published the formula for this preparation in the second volume of his great work, and the value of it is now, in consequence, well known to the profession. It is almost needless to add that great care is required in its preparation. I have met with specimens so ill-prepared that the strychnia was unsafely in excess. There is an old preparation of iron, formerly in the *Dublin Pharmacopœia*, which I regret is not in the *British Pharmacopœia*. I refer to the tincture of the acetate, one of the lightest and most agreeable forms of giving this remedy. The following is an excellent formula for pre-

scribing iron for delicate and fastidious patients of both sexes :—

Ferri et quin. citrat. ℥ij., acid citric. ℥i., spirit. chloroformi ℥ij., syrup, simp. ℥vi., tinct. aurant. ℥iv. ℞. The dose is a teaspoonful twice a-day in water. To those with time and means at their disposal, I urgently advise a course of the waters of Karlsbad or Homburg, of course to be used under local medical advice. I suppose I must in the last twenty years have sent at least a hundred sufferers to one or other of the places named. I can hardly call to mind a single instance in which benefit was not derived from the use of the waters named. In most cases this has been signal. I do not care to speak much of my personal experience, but I may be allowed to say that I never fairly got rid of malaria out of my system until, under the care of my kind friend, Dr. Deetz of Homburg, I went through two courses of the baths and waters there. I add one word of caution: the mineral waters there and elsewhere, prepared as they are in nature's own laboratory, are more powerful and subtle in their action than the world supposes; and at such places the maxim "every man his own doctor," is a dangerous one. I have seen consequences little short of disastrous from their use without the necessary guidance as to selection of spring, quantity, and dietetic regimen. When a visit to one or other of the spas named is impossible, the water of Karlsbad, in combination with that of Friedrichsall, taken morning and evening in moderate quantities, will be found most useful in removing congestion of the liver, aided by local

massage over the organ. Where the spleen remains enlarged and resists the means above detailed, the ointment of the biniodide of mercury locally applied often reduces the size of the organ with surprising quickness. I have used this remedy in this house for twenty years ; but I believe it was Mr. Macnamara, formerly of the Bengal army, who, knowing that this ointment is almost specific in reducing goitres, first applied it to the reduction of enlarged spleens in India. The strength of the ointment is 15 grains to an ounce of lard or vaseline. A portion about the size of a large nutmeg should be gently rubbed in with a smooth paper-cutter or spatula over the swelling, before a fire, and, if needful, cautiously repeated in about ten days. I say cautiously, as no good but much harm may result from bringing the constitution of the patient unduly under the influence of one or other of the constituents of this active drug.

Dr. Lauder Brunton has pointed out that patients sometimes suffer from sharp pain in the rectum just as the shivering fit is coming on ; he attributes this to some obstruction to the flow of blood through the hæmorrhoidal veins. The local pain is quickly relieved by 10 grains of quinine, or the application of warmth over the hepatic region and gentle rubbing.

This is the proper place to bring to your notice some of the *substitutes for quinine*. In the military hospitals of India quinine is now little used. Since the successful introduction of cinchona on some of the spurs of the Himalayas, and the beautiful "Blue Mountains" of Southern India, a cheaper drug is supplied by the Govern-

ment chemists, known as cinchona alkaloid. I have not had much experience in its use, but although more apt to disagree with men of delicate stomachs, it is found, as a rule, to answer well for general purposes. To be equally effective it must be given in fuller doses than quinine. Of arsenic I have already spoken, and repeat, that in my opinion it is better adapted to strengthen the system against the assaults of malaria than for the treatment of the fevers it causes; for some of the sequels, such as malarial neuralgias, it is often more useful than quinine, and may sometimes be combined with that drug with advantage. In the French army it is much used, for economical reasons, in the treatment of malarial fevers, when it is given with greater freedom and in much larger doses than are usually prescribed with us; the object being, as Boudin expressed it in a valuable communication to the late Dr. Morehead, to substitute an arsenical for a malarial diathesis.

The sulphate of cinchona is reported by Dr. Paul Turner, an American physician, to be efficacious to the extent of a scruple during the intermission, succeeding in 79 per cent of his cases. Salicine *per se* is not a reliable remedy, but the salicylate of quinine is now much used as a remedy in India after the regularity of the paroxysms has been broken; and it is very useful in the malarial neuralgias already spoken of. Professor Polli of Milan has written strongly in favour of the alkaline sulphites. Tried by our army medical officers in an epidemic of malarial fever in the Mauritius, they were of no avail. Much has been written lately in favour

of the *Eucalyptus globulus*, the so-called "fever tree" of Australia. It has been much vaunted in Germany. My trials of it in this hospital were unsatisfactory; I cannot deny it some power in mild cases, but in the severer forms of intermittent fever it is of little or no value. The preparation I used was a strong tincture made from the leaf, which when fresh gives out a strong camphoraceous odour. To this its supposed virtue as an antidote to malaria has been attributed. A belt of trees interposed between a source of malaria and human habitations has long been believed to intercept at least a portion of the poison, and the *Eucalyptus globulus* has been supposed to be peculiarly efficacious in this way. Although a hard-wooded tree, it grows with great rapidity; it is very greedy of moisture, and where planted in sufficient numbers, may act favourably as a consumer of moisture in the subsoil. Carbolic acid has been tried by Drs. Déclat, Barrant, and others, and by them supposed to be an infallible remedy against malarial fevers; but more extensive experiments made by Dr. H. Curschman of Berlin (1873), proved the supposed remedy to be utterly valueless.

I fear I must leave the interesting therapeutic question, "How does quinine act?" to those who devote themselves specially to this important branch of medical science. Herepath long ago showed that not much of it taken into the system is excreted from it; it is either assimilated or destroyed in its transit through the vascular system. Binz has shown its wonderful power in preventing and arresting putrescence and fermentation.

The high price of this invaluable drug has been a temptation to a few manufacturers to adulterate it; some years ago it was discovered that the hospitals in Paris were supplied with "quinine" adulterated "to nearly the extent of one-half with an inert substance." There is too much reason to believe that the supply of this adulterated drug was not confined to the Paris hospitals, and the fact will explain the unmerited disrepute into which quinine has sometimes fallen.

LECTURE IV

REMITTENT FEVER

DEFINITION.—A paroxysmal fever of malarial origin, in which the paroxysms do not intermit, but only, as the term denotes, remit.

It is the gravest form of the class to which it belongs. It is a more acute affection than intermittent fever, to which it is closely allied; one form often passing into the other. It is more pronounced in its symptoms, more rapid in its course, and the direct mortality from it is much higher. It has many synonyms, such as bilious-remittent, jungle fever; and it often gets local names from the place or district where it prevails to an exceptional extent—a bad practice, leading to confusion and misapprehension. The most objectionable name is inflammatory remittent, productive of mistakes as to its true nature, and sure to lead to treatment of a mischievous kind, based on false pathology. By the French it is known as *Fièvre rémittente*, in Germany as *Bösartigus endemisches feber*.

Remittent fever is seen in all climates where malaria is found in sufficient concentration to generate it. It

was at one time not uncommon in Britain, and our armies have suffered from it almost wherever they have served, very notably at Walcheren and Carthage—two of the saddest episodes in our military history; in the East and West Indies, in the Mediterranean, and with extreme intensity, in the west coast of Africa. In India we meet with it in the deltas of rivers, in terrais, in jungles at certain seasons, with great intensity at the base of mountain ranges, and not unfrequently in barren plains from which the cultivating hand of man has been withheld.

A remittent fever does not present in its course a distinct interval or period of complete apyrexia; the symptoms *abate*, they do not cease; the fever partakes more of the continued type; and the more this is the case the greater is the danger.

It is a common disease in Italy, and the French army has suffered severely from it in Algeria. In unhealthy countries it is often the first form of fever that attacks newcomers; but survivors in second attacks are more prone to suffer from the intermittent type. The medical officers of our army in Spain observed that men on first entering a malarial locality generally suffered from the remittent form, while the inhabitants were only affected by the intermittent type; if they continued to serve in the place they became liable, like the inhabitants, only to the milder form of the disease. The French army surgeons had a like experience in Algeria; out of 3199 cases of remittent fever only 359 had second attacks; while out of 15,080 cases of intermittent no less

than 4295 were readmitted with the same type of fever.

The anatomical characters are much the same as in the intermittent form, the difference is one of degree; this being so, it must suffice to refer to the description given in previous lectures. The mucous coat of the stomach and duodenum is more congested, and the tissues are more softened than in milder forms of malarial fever, and Brünner's glands are more enlarged. The blood changes also are more intense, and the consequent pigmentation of liver, brain, and spleen are more marked.

The *premonitory symptoms* are much the same as in other forms of malarial fever, perhaps more marked.

Cold Stage.—This is by no means so intense or so prolonged as in intermittents; often it is little more than a passing feeling of chilliness without distinct rigors. The thermometer shows a temperature two or three degrees above the normal, which rapidly rises, as the hot stage develops, to 5°, and sometimes even 10° above normal.

Hot Stage.—With this high temperature the whole system is disturbed into what Robert Jackson termed "a tempest of the frame." The skin is pungently hot, the face is flushed, headache is intense, the pulse rises to 120 or more, there is dorsal pain, the tongue is foul, dry, and bile-tinted. There is a sensation of oppression at the epigastrium, which becomes full and tense; vomiting now sets in, which brings no relief to the epigastric uneasiness; soon it becomes distressing, the

quantity of fluid ejected far exceeding what is taken by the patient. At first the vomit is colourless, then bilious, and sometimes even bloody, in so-called "pernicious" fevers even resembling the "black vomit" of yellow fever; the respiration is hurried, and the patient tosses in search of relief from change of position. In this state he remains for a time varying from six to twelve hours, then the symptoms abate, the skin becomes moist, far short of the profuse sweating of an intermittent, the temperature falls several degrees, never reaching the complete apyrexia of the milder type; the vomiting ceases, the headache lessens, and the epigastric fulness and tension decrease. This, in technical language, is the *remission*. Mark it well. It is not only an unspeakable relief to the patient, but a precious time for treatment. Even in the severest cases when the general symptoms abate so slightly as to escape the attention of an inexperienced observer, the thermometer will indicate the remission. In from two to twelve hours a sensation of chilliness will recur, soon followed by a rise in temperature and the other symptoms of the hot stage. This is termed the *exacerbation*, which in its turn again gives way as before to the remission. The longer the exacerbation, in other words, the nearer the fever comes to the continued type, the more dangerous it is. In this fever a morning remission is almost invariable, hence the old rule among military physicians in the West Indies, to pay an early morning visit to turn the hours of remission to the best account. The exacerbation usually returns at noon, and

often lasts till midnight. In the worst forms the skin assumes a yellow tint, to which the term yellow remittent is given. This has sometimes led inexperienced observers into mistaking the disease for specific yellow fever.

Hiccough is a troublesome symptom, and if it appears late in the disease and continues during the remission, is not a favourable one.

The bowels are usually constipated, but are sometimes loose. If the motions are bloody and offensive, a condition of evil omen is threatened.

Jaundice is rare; the yellowish tinge of the skin already described is not icteric, but depends on the escape of the colouring matter of the blood into the tissues, and is an unfavourable symptom. Completely developed jaundice only occurred in 28 out of 114 of Dr. Morehead's carefully observed clinical cases.

Hepatitis, at least in India, is rare, very rare in the course of this fever, although the gastro-duodenal tenderness, always more or less present, often leads to an error in diagnosis. It was not until I had an opportunity of seeing cases of this fever brought to Netley from the west coast of Africa that I saw genuine suppurative inflammation of the liver running its course in men suffering from unmistakable malarial remittent fever. In the cases referred to, and in many others from the same region, under observation at the same time, a distinct and most offensive odour proceeded from the patients in the sweating stage, compared by the sufferers themselves to that of the pestiferous swamps from whence came the malaria that poisoned them. This

odour was quite perceptible on the towels with which they dried their bodies, and on their bedding.

The *urine* is acid, scanty, and high-coloured, very rarely albuminous. During the hot stage the secretion of urea is much increased, but lessened during the remission. In some cases of this fever recorded by me, there was profuse secretion of bloody urine, which lasted until convalescence set in.

The adynamic form of remittent fever is one of great gravity. It is characterised from an early stage by prostration, brief and uncertain remissions, a quick and compressible pulse, a black and dry tongue, the teeth being covered with sordes, rapid respiration, epigastric tension and oppression, with vomiting, often bloody; loose, offensive, and bloody motions, with a disposition to hæmorrhage from the mucous surfaces generally. This is a form of fever common in the most malarious regions of Italy, occurring in men debilitated by long exposure to the poison, and this is the form to which Continental writers apply the term "pernicious." It is a fatal form, and *post-mortem* examination often reveals ulceration of the small intestines, as well as the usual morbid appearances of malarial fevers.

The *duration* is from five to fourteen days. In the worst forms death is rare before the eighth day. But, as in all malarial fevers, the duration is much affected by treatment.

Diagnosis.—In the article "Remittent Fever," in Quain's *Dictionary*, I have given the diagnosis between this and specific yellow fever in the following words:—

Remittent is paroxysmal; yellow fever is continued. Remittent has a morning remission; yellow fever has not. Hæmorrhage from any source is exceptional in remittent; in yellow fever it proceeds from mouth, nose, eyes, ears, bowels, the urinary passages, and from any broken surface or scratch on the skin. Over remittent fever the power of quinine is beyond question; the drug is powerless in yellow fever. Death in the worst remittents is uncommon before the eighth day; in specific yellow fever it is common on the third day. The mortality-rate in yellow fever is often 40 per cent; that of remittent in the present day does not in India exceed 4 or 5 per cent, and is often much less. Yellow fever is portable and contagious; remittent is neither. Yellow fever has a special habitat of its own, and can only exist as an endemic disease in countries where the mean temperature does not fall below 72° F. Lastly, specific yellow fever is not a disease of India, where every form of malarial fever exists as an endemic disease. It will be more convenient and save repetition if I postpone what I have to say on the more difficult question of the diagnosis of malarial from tropical enteric fever, until I come to the description of that disease.

Prognosis.—This is favourable when the remissions are distinct, when the interval between them and the exacerbations is prolonged, when the skin acts freely, and when the urine deposits a sediment like that in intermittent fever.

Faint and uncertain remissions, a tendency to collapse

as the fever progresses ; in a word, when symptoms generally recognised as typhoid appear, and when there is a tendency to hæmorrhages from the mucous surfaces, all point to an unfavourable termination, and indicate the necessity of energetic conservative treatment to rescue the patient from a perilous condition.

Treatment.—It has been my fortune to have to treat this disease in some of the most unhealthy climates in India and China, and in the persons of invalids who have had a recurrence of it on their return from the west coast of Africa. When I first went to India the treatment left as a bad legacy to Indian practitioners by Dr. James Johnson was still in vogue among some of my older brethren. Johnson was a naval surgeon whose experience of tropical diseases was confined to the seaboard of India ; he had for patients seamen whose constitutions were not deteriorated by long residence in malarial climates ; he was a man who “had the courage of his opinions,” and never failed to convey them to others with some literary ability, and with a dogmatism very satisfying to young and inexperienced men in search of guidance under difficulties. Johnson, in a word, mistook the disturbance of the system, the “tempest of the frame,” for inflammatory action ; and taught that this was to be met by energetic “anti-phlogistic treatment,” carried out with a high hand, and with unflinching faith. He bled, he leeches, he bled again, he purged, he salivated. What success he met with at sea, it is not for me to say, I do not in fact know ; but this I do know, his disciples on shore, of

whom some, a select few, survived to my day, a "survival" not perhaps of the "fittest," were faithful to the teaching of their master. The result was not satisfactory ; I put it mildly when I say the mortality was ten times what it is to-day. Happy, I sometimes thought, were those who succumbed in comparison with others who came out of the unequal battle, blanched, maimed, almost toothless, and mercurialised. Enough, let us turn from the contemplation of this picture, not, however, before I add that the system was a departure from an older and better one, under which the predecessors of the Johnsonian school successfully treated this formidable fever, with no better weapon than crude "Jesuits' Bark," which, to use their own phrase, they "threw in" with generous hands.

The indications of rational treatment are plain and simple, viz. to prevent the recurrence of the exacerbations by means that do not injure the constitution, and to sustain the system until it throws off the poison that oppresses it.

No question of the use of emetics comes in here ; nature solves that even too energetically. It is, however, a matter of real importance that the bowels should be unloaded ; it is certain that this is essential to the due action of quinine. Under the head of intermittent fever I have given you Livingstone's effectual method of doing this, and also a formula that I have found to answer the purpose equally well. Can we do anything to mitigate the severity of the stage of exacerbation and to shorten it ? We have in aconite a remedy at once

safe and effective, if judiciously used, and which has the inestimable advantage of leaving no sting behind it. I advise you to administer it in the mode advised by Professor Ringer, in drop doses every ten minutes for an hour, and then every hour or half-hour until the temperature begins to fall and the skin to act. If you use Fleming's Tincture, remember that it is five times more powerful than the official preparation, and use it with the necessary caution. Aconite used in this way acts as a calmative, depressent and diaphoretic, and given as advised in a teaspoonful of water, it tends rather to restrain than to provoke vomiting. As soon as the first sign of remission is given by the thermometer, quinine should be administered in a full and effective dose of not less than 10, and not more than 20 grains; it is, I think, more effective given in solution. Some patients dislike the bitterness of the remedy so much, and the condition of irritability of the stomach is so great, that pains should be taken to lessen this—the addition of some such corrective as syrup of orange, or where available, the quinine may be given in capsules, which are now elegantly prepared by French and American pharmacologists, who take more pains to make physic palatable than is done in our country. The dose should be repeated during the remission so as to ensure the patient being under the influence of the drug before the time of expected return of the exacerbation. The surest indications of sufficient cinchonism is some degree of ringing in the ears. I am no advocate for "pushing" quinine to excess by the use of doses to

the extent of half a drachm or a drachm, which not only induce deafness, but even temporary blindness. This, to my mind, is to abuse and to bring into disrepute an invaluable remedy. I have already shown you how a patient may be brought under the influence of quinine by injection into the bowel, a method which is often called for when the stomach rebels against its use by the mouth. Remembering that quinine acts powerfully in reducing temperature, it may be given in this way even in the hot stage, to the extent of a scruple with advantage, when, if given by the mouth, it would be at once rejected. Like many other drugs, quinine is more than twice as effective when given hypodermically. There is no doubt that remittent fever has in this way been very effectually treated; but if the quinine is dissolved, as it usually is, with the aid of a mineral acid, it is apt to cause troublesome ulceration. When this method was in vogue in India some years ago, many of our invalids coming to Netley carried on their arms and other parts of their persons cicatrices of pretty deep ulcers caused in this way. This led me to make trial of the more soluble so-called neutral-sulphate of quinine for this purpose, which answered equally well; 5 or 6 grains will dissolve in much less than a fluid drachm of water with a little heat, and this injected into the skin did not, in my trials, cause ulceration or even irritation. The syringe for this operation should be larger than that used for the injection of morphia, and the needle should be made of platinum.

I must not, however, fail to bring to your notice a

very grave objection to the use of quinine in this way. Some years ago tetanus followed this operation in six cases in India. The late Sir William Muir, when director-general, was kind enough to send me the details of the cases, so there can be no doubt of the fact. I cannot tell you the proportion of cases in which so disastrous an effect followed, whether or not any considerable branch of a nerve had been wounded, or whether the instrument had or had not been properly cleansed in a disinfecting fluid after use; but with the knowledge of the fact I have just given you, I think you will not be very ready to subject your patients to such a grave risk as this, when other means of effecting your purpose are open to you. There is, to my mind something revolting in a death brought about, directly or indirectly, by a remedy intended to cure.

There is yet another way in which this fever may be dealt with. I have, in the lecture on intermittent fever, brought to your notice some of the substitutes for quinine. I have reserved until now one which can hardly be called a substitute, inasmuch as that drug enters into the *formula* for the remedy. This is Warburg's Tincture, the composition of which is shown on the board behind me;¹ it will strike you as a mere farrago of drugs, some of them obsolete. The quantity of quinine in each ounce of the tincture hardly exceeds 9 grains; yet, thus combined, it acts on the system with great energy. The tincture is in fact the

¹ The formula for the preparation of this tincture will be found in the Appendix.

most powerful diaphoretic known to me. It is sold in small bottles, each containing one ounce. It can be given in the hot stage after the bowels have been freely relieved. Half an ounce is given undiluted, the remaining half ounce in about from two and a half to three hours, as little fluid as possible should be taken immediately after it; the result is almost certainly a marked reduction of temperature, and profuse action of the skin, with a proportionate relief of all the symptoms. The remedy should always be given to the patient in bed, when it is more effective. It often happens that one administration of the tincture suffices to bring the fever to an end without another.

I cannot refrain from mentioning the first case that came under my notice in which a valuable life was saved by this remedy. When attached to the Political Residency of Hyderabad in the Deccan, information was brought to the Resident that his son-in-law, an intimate friend and brother officer of my own service, then acting as statistical surveyor of the Deccan, had been brought into a station about 80 miles away, in a hopeless state, from remittent fever, and delirious. I hastened to his assistance. Arrived at the station, I approached the house where my friend was from the rear; I observed a quantity of bedding and night-clothes exposed to the sun, and concluded that I had arrived too late to be of use to my friend. On entering the house by the front, I was joyfully surprised to find him sitting in the hall, not only free from fever, but well and in excellent spirits. I then heard that an officer, be-

longing to the Mysore Commission who was passing through the station, had persuaded the medical officer in charge to give Warburg's Tincture, which, acting in the manner I have described, brought the attack to an end with profuse action of the skin, which explained the drying process that alarmed me. This officer had no return of fever, and soon returned to duty. I was assured by the medical officer of the station that nothing could be more alarming than the condition of his patient when brought under his care. Encouraged by this trial I have since used it in a great number of cases, and I can truly say it has rarely disappointed me. I admit that in very adynamic cases the free diaphoresis it causes will need caution in its use, and liberal support during its action.

This remedy was first introduced into India by the late General Sir Mark Cubbon, K.C.B., when that eminent administrator was commissioner of the Mysore province. It was largely and successfully used by the medical officers of the Mysore Commission, and such was the confidence it inspired in the administrative officers of the commission, that the most malarious parts of the province were visited by them without fear. By my advice the late lamented General Gordon took a supply of the tincture with him to the Soudan, and on several occasions, as he more than once assured me, his own valuable life and that of others was saved by it. This remedy is better known and more used in Southern India than in Bengal. Its reputation was much injured by a spurious imitation of

it, which was unfortunately on one occasion supplied to the Government of Madras. I must frankly tell you that some odium fell on me for using and recommending "a secret remedy" before its composition was made public. I am as much opposed as any one in our profession to the use of secret remedies, which nine times out of ten are either useless or dangerous; but there are exceptions to most rules, and this, it appeared to me, was one of them; of this I am certain, I have saved many valuable lives with it. In Rome, or its neighbourhood, I was unlucky enough to recharge my system with malaria, a charge which exploded in Florence in a most severe attack of remittent fever; when the thermometer gave in the early morning the first indication of a coming remission, I had recourse to this febrifuge; shortly I was bathed in a perspiration so profuse as to saturate bed and bedding, to my unspeakable relief; no exacerbation followed, and in twenty-four hours I was in the famous picture galleries free from every trace of fever.

My friend Dr. W. S. Playfair has used this tincture in some bad cases of puerperal fever with good effects, and its therapeutic action has also been investigated in an interesting communication to *The Practitioner* by Dr. Broadbent. It is quite possible that the action of quinine may be in like manner assisted by combination with other aromatic stimulants.

Once more I must insist on the necessity of due support by suitable diet during the remission, and stimulants on the first sign of failure of the heart's

action. Treated in this way, the death-rate from even the worst forms of malarial fever among Europeans in India ought to be, and in point of fact is now, remarkably small. In the year 1884 the latest statistics that came under my observation, the total mortality from malarial fevers in the European part of the army of India, was only 0.02 (representing the death of one man), a mortality nearly seven times less than the average mortality of the last decade. There was no diminution in the number of admissions from fevers of this class in the year in question, which amounted to 1350 per 1000.

I closed the article on "Remittent Fever" in Quain's *Dictionary of Medicine* by a quotation from the writings of an intelligent friend and fellow-traveller of Livingstone, which I repeat here: "One thing, however, must be strongly urged, it is that all notions about not being able to 'stand quinine,' that it 'flies to the head,' and so forth, must be banished as utter nonsense. In Africa every one can stand quinine; there is scarcely a disorder there in which it is not positively required." I add, from my own experience, that this observation is as true of malarial regions in other parts of the world as it is in Africa.

LECTURE V

ENTERIC FEVER

IN the introductory lecture to this course, I mentioned that it was the late Dr. Bryden, of the Bengal army, who first seriously awakened the attention of the profession in India to the widespread distribution of enteric fever in that country, and brought out the fact that youth and recent arrival there are intimately related as predisposing causes of this fever. It is not in the army of India only that this disease proves destructive; the French army, serving in Algeria, has suffered in like manner. As in India, so in Algeria, the young and the newly-arrived are the victims. When the Pontifical States were occupied by the French army, the mortality from this fever reached in one year the high figure of 20.3 per 1000 effectives. The reports of the sanitary commissioners in the three Presidencies conclusively show "that the disease attacks soldiers of short residence in India in much greater proportion than others; and further, that the greater the proportion of young unacclimatised men in the army of short residence in India, the greater is its liability to loss from this disease."

The following table shows the mortality from enteric

fever, and ratio of liability to it at different ages. From Twentieth Annual Report of Sanitary Commissioners with the Government of India :—

Year.	Under 25.		25 to 29.		30 to 34.	
	Deaths per Mille.	Percentage of Liability.	Deaths per Mille.	Percentage of Liability.	Deaths per Mille.	Percentage of Liability.
1877	2.45	44.2	1.55	27.9	0.99	17.8
1878	6.04	53.0	3.55	31.1	1.04	9.1
1879	6.17	54.1	2.73	23.9	1.78	15.6
1880	6.25	56.26	3.15	28.35	1.09	9.81
1881	4.56	59.84	1.57	20.60	0.79	10.37
1882	4.32	56.18	1.55	20.16	0.78	10.14
1883	4.34	66.36	1.50	22.94	0.70	10.70

In further illustration of the fact so well brought out by the table showing the influence of youth, the following facts may be given from the same Report :—At Lucknow 44 cases of enteric fever occurred in one year (1883); of these no less than 35 belonged to the Derbyshire Regiment, recently arrived from Egypt, principally composed of young soldiers. Of the 44 cases, 33 occurred in men between 20 and 24 years of age, and 9 in men from 25 to 29; 33 had been less than a year in India, and 5 over one, but less than two years. Evidence to the same effect could be multiplied indefinitely.¹

¹ There is nothing peculiar to hot climates in all this, for the enteric fever age is about the same in all climates.

Until the year 1861 enteric fever never appeared in the medical statistics of the army of India, European or native. Fevers were registered under three heads—Intermittent, Remittent, and Continued. The two first were regarded as without question due to malaria. Under the heading *Febris communis continua* were classed all fevers not distinctly paroxysmal. I do not doubt that hundreds of cases formerly regarded as the adynamic form of remittent with imperfect remissions, were in fact cases of enteric fever, and would now be so diagnosed and classed ; and that a large proportion of those entered in the returns as common continued fever, more particularly those with a history of “bowel complication,” as the diarrhœa of such cases was often phrased, were enteric, as we now understand the term.

After what has been said, I need hardly add, I do not admit that enteric fever is a new disease in India. In the Madras General Hospital, as far back as the year 1838, the year of my first connection with India, at Secunderabad, in the Deccan ; in China, as far north as Nankin, I saw and treated cases of continued fever, extending over twenty days in duration, with the “bowel complications” above referred to ; if I saw such cases now I would unhesitatingly diagnose them as enteric fever. The symptoms were the same, the mortality exceeded that of fevers distinctly malarial, they were not amenable to quinine, intestinal hæmorrhage was not uncommon, and the intestinal lesions were what we now recognise as characteristic of enteric fever. It must be kept in mind that clinical thermometry only came into

general use in India in 1861, or thereabouts, as an aid in the diagnosis of disease. It was on my return to India in 1857, after two years' residence in Europe, that I satisfied myself that fevers such as I have described were none other than enteric. I then saw, treated, and dissected cases of fever as distinctly enteric in symptoms, progress, and *post-mortem* lesions, as any to be seen in the London Fever Hospital. No attentive student of Indian medical literature can doubt that Clark, Annesley, Twining, and others treated and dissected cases of enteric fever; reading the accounts they have left in the light of modern science. There are more Europeans now in India of the enteric fever liability age than in their day. No one dreams of dating the existence of enteric fever in Great Britain from the researches of Dr. A. P. Stewart and Sir William Jenner. Like them, we study disease from better standpoints, with more light, with better means of research, and as a natural result our diagnosis is better.

What is the cause of enteric fever as we meet with it in tropical and sub-tropical climates? Here we get on controversial ground. I am not here to dogmatise, to assert that enteric fever has no other factors than those with which we are familiar at home; but this I do say, those who assert that the fever so fatal to young soldiers in India cannot in any case be traced to a pythogenic origin, have a difficult thesis to maintain. Few, if any, in this country doubt that this fever, in the language of Professor Aitkin, is generated by a specific¹ morbid

¹ Professor Aitkin now (1836) disavows his old belief in the *uniform origin* of specific diseases. He holds that such an opinion

cause, fostered by, if not actually born of, decomposing nitrogenous matter. I ask is there any country in the world where decomposing nitrogenous matter is more abundant than in India? If so, what is there in the nature of the climate or in the soil to hinder the genesis of the contagium of a disease that elsewhere owns decomposing nitrogenous matter for its parent? It is said, and truly said, that the present sanitary condition of our barracks in India and their surroundings is such as to forbid the origin of such a contagium in or about them; that there is no such thing as sewer air in them. On this point I remark that this improvement is, comparatively speaking, a thing of yesterday. I have seen, and very notably in the barracks of Fort St. George in Madras, and the old infantry barracks of Secunderabad, of dysenteric notoriety, the latrines so placed and their conservancy so bad, that a privy atmosphere pervaded certain dormitories near them, and I long ago placed it on record that the majority of cases brought into hospital of dysentery, diarrhoea, fever, and cholera, came from the barrack rooms under this influence; and Surgeon-General Cornish, when sanitary commissioner of Madras, noted, in one of his reports that when the dry-earth system of conservancy was substituted for the old latrines, and when the sea-wall of the fortress was thrown down, admitting free perflation of air, an immediate diminution in the number of fevers took place.

The same high authority records that when typhoid is now inconsistent with the light thrown on pathology by the Darwinian hypothesis of evolution.

fever prevailed in the artillery barracks at St. Thomas' Mount, near Madras, "local nuisances were abundant in the shape of foul drains and cesspools in the neighbourhood of barracks and hospitals." As for the old privies of the Secunderabad barracks—I quote from the official report of Superintending-Surgeon Cole—"They were positively pestiferous, the buildings and their neighbourhood were sodden and saturated with the foul imbibitions of a long series of years, and emitted most offensive odours." When this description was written, the regiment then in barracks was suffering from a non-malarious fever of a continued type, and extremely fatal, and Mr. Cole was of opinion that the disease was propagated by a direct contagium from the morbid alvine discharges. I pray you to note this significant fact. The 17th Lancers occupied these barracks after these dreadful latrines were abolished and the dry-earth system substituted, and the result was that the regiment, with an average strength of 576, in three years lost only 37 men from all causes; a death-rate which, at the period in question, was a mere flea-bite when compared with the mortality of previous years in the same barracks, such, for example, as that which the Royal Scots suffered, when in one year, out of a strength of 1098 men, the regiment lost 104 men from dysentery alone.

I admit the immense improvement in the sanitary condition of the barracks in India; but, I ask, are our soldiers confined to barracks? Notoriously they are not. The native bazaars and villages within easy distance of most of our cantonments stand on soil for ages sodden

with excremental matter, and the tanks and wells of such places are befouled with all manner of impurities. This being so, we naturally turn to the media by which such impurities may be conveyed into the system. Are these not the same there as here? "Organic-laden air, water, milk, or other beverages," articles of food, all freely used by young soldiers in such places, and even, as Dr. Kerr Innes has suggested, clothes washed in tainted water.

I am well aware that pains are taken to supply our barracks with the purest water obtainable; we know too well that even in this country this desirable end is far from being always attained, and it is notorious that in India a pure water supply is one of the greatest difficulties for the sanitary engineer. The simple fact is, and must be, that when soldiers leave their barracks they drink when they are thirsty, without curiously inquiring about the source of the water supply. In the barracks at Rawul Pindi some years ago an outbreak of enteric fever occurred, and several men died. One of the wells of supply was found to contain more than 12 grains of organic matter per gallon, and the water was thick and offensive, and Dr. Gillespie noted the significant fact, that after that well was closed no more cases of enteric fever presented themselves. Surgeon-General Sir Anthony D. Home, V.C., K.C.B., in a report addressed to the Government of Madras, states the following facts: "During the third quarter of the year under report there occurred in the 2d Battalion 13th Regiment at Kamptee twenty-three cases of fever, of which eight were returned as enteric, and the rest as simple continued fever."

Regarding the latter, it has to be observed that from the description given, they appear to have been also cases of enteric fever of a mild type. The twenty-seven men attacked belonged to various blocks in the barracks, and no room seemed to be more obnoxious to the disease than another. The latrines were all in fair order, and no suspicion attached to them. The drinking water supplied to the barrack rooms was taken from a well specially conserved for the supply of drinking water, and after being drawn from the well, it was passed through a filtering tank, and again filtered in barracks. The milk was also above suspicion.

After a time it was noticed that nearly the whole of those attacked were total abstainers from intoxicating drinks. Further inquiry elicited the fact that the total abstainers had a recreation room, where tea, coffee, and aerated waters were supplied, and that the water used in their preparation was taken, not from the well set apart for drinking, but from another close at hand, considered fit to furnish water for cooking only. This well was situated close to the site of former latrines, the surface drain from the wash-house passed within 4 feet of it, and, on closer examination, signs of percolation from the drain into the well were discovered. On analysis the water of this well contained an excess of organic matter. The well was closed, and the fever ceased. In this case it was possible to trace the disease to its source, just as we see done constantly by experts in this country. It is clear to my mind that if outbreaks of enteric fever in India could be subjected to such an

exhaustive inquiry as the one under notice, the result in many, perhaps in most, cases, would be the same.

The station of Bangalore, in the Mysore province, in the Presidency of Madras, is the most coveted station in Southern India. Its water supply has always been most unsatisfactory. In 1883 40 cases of enteric fever were reported as having occurred among the British troops serving there. The medical officer's views on this outbreak were as follows:—"No insanitary defects could be discovered within the barracks. The water supply—mixed with water from the Ulsoor tank and dhobies' (washermen) works (as usual)—was impure from contamination by excrement and filth of every description. There is not only the immediate danger from the pollution of the water supply tank, but as a portion only of the filth washed into it becomes oxidised and innocuous, the remainder is deposited on the bed of the tank ready to give forth in the dry season, when the water is low and the bed of the tank (125 acres in extent) is exposed to the sun, the noxious vapour which, in conjunction with the use of the water, predisposes to, if they do not directly cause, this fatal form of fever." To this report the surgeon-general adds:—"The conditions referred to in these extracts are, in my opinion, sufficient to account for the prevalence of enteric fever in Bangalore."

I could, from the mass of material at my command, multiply examples of this kind; the above must suffice.¹

¹ Because I have insisted so much on the fact that enteric fever has in India a filth origin in many cases as much as in Europe, I

I must not omit to bring to your notice a notable fact that cannot be easily made to fit in with the pythogenic theory. I refer to the number of cases of this disease reported as having occurred among young officers and soldiers while campaigning in Southern Africa and in the deserts of the Soudan ; a subject of melancholy interest to us in this school, for it is with pain I record the fact that some of your almost immediate predecessors on the benches you occupy, succumbed to the disease in Egypt since our troubles and military operations in that country began in 1882, all of them within the enteric fever age ; for I observe the fact "that no medical officer of the rank of surgeon-major died of the disease." What has been said on the pythogenic origin of the fever in the examples given cannot be gainsaid, unless you follow the simple and easy process of throwing overboard the evidence, a small part of which only I have had time to place before you, which has been accumulated by trustworthy observers. We can without difficulty account for the cases which occurred among our young officers and soldiers when quartered in insanitary and uncleanly cities like Cairo and such places as

may possibly be thought open to the charge of entertaining opinions too exclusive on this point. I believe, however, that in my teaching here I have shown myself alive to the modifying influence of malaria and climate on the symptoms, course, and lesions of the disease. I cannot be blind to the fact that, due allowance being made for the modifying influences named, we do see in India a large number of cases of true enteric fever with a filth history ; and I avow my belief that in many others where the filth factor is denied, it is because its existence has not been traced.

Suakim ; but how are we to explain the fact that some officers and men suffered from the disease in the desert, far from human habitations and the filth invariably to be found near them in such regions? I can conceive it possible that in an uncertain proportion of cases the sufferers contracted the disease in one or other of the places named, although it did not develop itself until they were far from the spot where the contagium was taken into the system.¹ Again, knowing as I do the rapidity with which even in desert places insanitary conditions are established in camps that occupy a fixed position for even a short time, I can conceive it possible, and even probable, that some cases might be traced to a cause generated in this way, and once a zymotic element is introduced into a camp, even by a few cases, it is not difficult to account for the spread of the disease. I do not, however, wish to dogmatise on this, I admit, difficult question ; we must await the result of more light and careful study and experience. I have always held that enteric fever can arise *de novo*, and the examples given strongly support the hypothesis ; and while it will be seen that I am much impressed by the part filth plays in the genesis of enteric fever in tropical climates as well as at home, I admit to the fullest extent the influence of climate, malaria, and it may be other as yet unknown factors in modifying the symptoms, temperature curve, course, and duration of the fever, as well as the lesions

¹ In considering the possibility of such an occurrence the long period of incubation must be kept in mind, extending as it does sometimes over twenty days.

found after death. Above all, I warn you that while purely typical cases of enteric fever will be seen in tropical and malarial climates, many will present more or less of that mixed character on which American physicians have insisted so much. I must not omit to mention that a specific typhoid bacillus existing in the lymphatics, blood, and tissues, is said by Klebs to be the cause of this fever. That this eminent observer found a bacillus such as he describes, we need not doubt. On the other point let us reserve our judgment, and, as in other cases of a like kind, await the result of further investigation.

Anatomical Characters.—The structural lesions observed in a typical case of enteric fever are described in all the text-books in your hands, with so much care and minuteness that it would be a waste of time to repeat the description. The most characteristic are found in the small intestine and mesenteric glands; the part most affected being that portion of the ileum near the cæcum, where Peyers' patches present changes which are recognised in Europe as pathognomonic of enteric fever.

I hand round some drawings made in the dead-house of an Indian military hospital, by Surgeon-Major Gillespie. I particularly ask your attention to the drawing marked No. I.; it represents a portion of the ileum near the cæcum; note the swollen and congested state of the mucous membrane, the enlargement of the solitary glands, some of them having evidently burst and discharged their contents, and passed into the stage of ulceration; above all, observe the condition of the agminated glands which constitute Peyers' patches. One

stands out throughout its entire length, many lines above the level of the surrounding mucous membrane ; note how the glands are swollen and distended with exudative matter, having the "tawny" or fawn colour described by Professor Aitkin, Dr. Broadbent, and other authors. In other parts you will notice that the process of softening is more advanced, the distended glands having burst and discharged their contents, leaving behind the "reticulated," "pitted," or "sieve-like" appearance, so named by many pathologists. In the drawing marked No. II., the patches are represented in a more advanced stage still, that of ulceration, with detached circular ulcers of various sizes, scattered over the mucous membrane. In the notes of the cases sent to me with these drawings, the spleens are reported as having been "enlarged, soft, the tissue easily broken down."

The drawings were taken from men who died at Rawul Pindi, already referred to, with all the symptoms of enteric fever. One of the barrack wells was found on examination to contain water described as "thick and offensive," with 12 grains of organic matter to the gallon. The use of this water was forbidden, and no more cases of enteric fever appeared. The medical officer advised that the well should be permanently closed, as others gave an abundant supply of water of good quality. This was not done. The reason is thus given in the report from which I quote: "The authorities do not yet sufficiently believe in the possible effects of bad water." Perhaps, if the "authorities" could be persuaded to drink this "thick and offensive water" for a month, it might carry conviction, if not to their minds, to that part of

their organisation depicted in the drawings we have been studying.

The morbid appearances in the mesenteric glands are pretty nearly as constant as those in the glandular structures in the ileum; they are enlarged and filled with exudative matter of the same appearance and colour as that found in Peyers' patches. The heart, in prolonged cases, is found soft and flabby, the muscular fibres being in a state of degeneration. This condition is common to other fevers of long duration attended with high temperature, and failure of its action from this condition is often the cause of sudden death, one of the many contingencies of this fatal fever. The structural changes of the liver and kidneys is due to the same cause—long-continued high temperature.

The malarial element enters so largely into all febrile conditions in India and other malarial countries, that the usual organic lesions caused by that agent are rarely absent.

The symptoms of enteric fever as seen in Europe are to be found in the text-books in your hands. I cannot hope to add a single word to the description given by Murchison, by Dr. Broadbent, and by my colleague Professor Aitkin, in his great work, now in all your hands; to repeat what they have written would be "wasteful and ridiculous excess," to compress would be to spoil. My business here is to describe to you how this disease presents itself to us in malarial climates, modified as it almost always is by the action of that ever-present poison. No easy task. Doubtless in the

persons of late arrivals, before their systems have been much affected by malaria, the diagnosis is not more difficult than at home. I now show you the temperature chart of a case of this kind, for which I am indebted to my friend, Surgeon-General Sir Anthony Home, and with it, for the sake of comparison, I place one from Wunderlich; you will see that they correspond in all essential particulars. There is the same gradual rise in the temperature, which did not attain its maximum until the fifth day, when it reached 105° F.; there is the usual evening rise and morning fall. In the Indian chart the temperature was much affected by the cold bath, the dotted line showing the fall after each emersion. Towards the last days of the attack the oscillations, if not so marked as in Wunderlich's typical chart, are sufficiently evident, and towards the end we observe the characteristic lengthening of the morning remission. The chart gives also the pulse and respiration rates, the nature of the stools, and the date on which the rose spots appeared. The pulse rate never exceeded 84; the stools throughout were "bilious," and do not appear to have presented the pale brownish-yellow colour with flocculi, so characteristic of enteric fever, and the average number throughout was 3.3 daily, but they were foetid. The rose spots appeared on the seventeenth day, and were present until the twenty-first day. The condition of the spleen is not noted on the chart.¹

¹ The characteristic eruption of enteric fever is not so common in India as at home; and, as in this case, the crops of rose-coloured spots appear later in the disease. Some care is necessary to differentiate them from the bites of insects.



In his report for 1883 the sanitary commissioner, with the Government of India, remarks: "The reports by medical officers on cases of enteric fever occurring under their care show, as usual, how indefinite are the symptoms which are often presented by cases of this kind. In numerous instances the patients were admitted as suffering primarily from ordinary remittent fever, and even febricula. Thus one medical officer writes: many of the cases were admitted for febricula, and after a few days changed to enteric fever. Another writes: the eruption of enteric fever is more often absent than present; diarrhoea invariably absent until the disease is far advanced; pulmonary complications are severe, congestion of the lungs setting in early."

The most distinctive diagnostic symptoms between enteric fever, pure and simple, and malarial remittent are as follows:—

Enteric.

Onset gradual, no rigors, only sense of chilliness.

Rise of temperature gradual; maximum not attained for days.

Evening rise of temperature and morning remission; difference between morning and evening temperature not more than a degree or one and a half, at a later period as much as two and more.

Heat of skin not distinct to hand even when thermometer indicates that the blood is many degrees above normal.

Malarial Remittent.

Onset more sudden, rigors not distinct.

Rise much quicker, attaining maximum in a few hours.

Morning fall of temperature amounting to 3 or 4 degrees.

Skin hot and pungent to hand.

<i>Enteric.</i>	<i>Malarial Remittent.</i>
Headache moderate, face slightly flushed.	Headache severe, face flushed.
Tongue coated in centre, red at tip and edges, redness increasing as case advances.	Tongue foul throughout.
Abdomen tumid and splenic dullness early.	Abdomen not so tumid, epigastric oppression marked, spleen also enlarged.
Tenderness and gurgling in right iliac fossa not always present.	Absent.
Diarrhœa the rule; motions sometimes bilious, sometimes pale brown with flocculi; rose spots occasional.	Constipation the rule; no eruption.
Pulse and temperature do not always correspond; pulse may not exceed 90 when temperature may be 105°; often dicrotous.	Pulse and temperature more nearly correspond; with a temperature at or above 105° pulse would generally be over 100, 110-120.
Relapses common.	Not often seen, although remittent may pass into intermittent form.
Duration from 17 to 24 days.	Does not usually exceed 10 or 14 days.
Death not common before end of second week.	Death sometimes as early as eighth day.
<i>Complications.</i> —Hæmorrhage from bowels, perforation, diarrhœa, albuminuria, thrombosis, embolism, congestion of lungs, pneumonia.	Hæmorrhage rare, albuminuria very rare; pulmonary complications common.
Enteric fever not much if at all under control of remedies as to duration.	Remittent fever can be cut short by remedies at an early period.

The cases of enteric fever admitted into Netley Hospital from Egypt differed in no particular from cases of the same disease contracted in this country. Relapses were common to them all. In one case, that of a young officer, the first relapse followed a full meal taken at Malta. Up to the arrival of the transport at Malta he was considered convalescent, and his diet had been strictly regulated; he broke through the rule of diet ordered, a relapse with profuse diarrhœa followed immediately, and he was admitted to the sick officers' quarters at Netley in a state of great prostration; three other relapses followed, with, on two occasions, hæmorrhage from the bowels; he was more than once rescued from impending death by the watchful promptness of the night-nurse in attendance.

Treatment.—The principles of treatment are much the same everywhere, the most essential points being a well-ventilated room or ward, good nursing day and night; a careful record being kept *from first*, not from memory afterwards, of temperature, pulse, excretions, food, and medicine. Every evacuation should be powerfully disinfected and so disposed of as not to risk the contamination of the water supply. From an early part of the treatment the bed-pan should be used—late in the disease this is imperative; cases of sudden death from non-observance of this rule have been frequent. The patient's linen should be frequently changed as well as his sheets, with as little disturbance and fatigue as possible. For this purpose it is well to have his night-dress made like a child's pinafore, which the

attendant can remove and replace without much disturbance of his person. Where possible two beds should be used, one for night and the other for the day; the bedding of the one not in use to be well aired. Sponging of the body with tepid water, to which permanganate of potash may be added (Broadbent), is most refreshing: it promotes sleep and calms restlessness; if the temperature is high, the water may be used some degrees lower than the temperature of the body. Milk should be the chief article of diet, to which, if any of it is passed in a curdled state, some lime water should be added, lest diarrhoea be provoked. Bread should be sparingly given, if at all; it is apt to ferment, and is better omitted from the diet altogether. From two to three pints will be required every twenty-four hours, supplemented by a pint or a pint and a half of beef or chicken tea. Patients soon get weary of beef tea. I have often found that the addition of a teaspoonful of Valentine's essence of beef makes it more palatable. This can also be given cold in a little water, and is sometimes much relished. Food should be given regularly every three hours, day and night; a little hydrochloric or phosphoric acid may from time to time be given as an aid to digestion. If the liquid stools exceed three in twenty-four hours, they should be restrained; an enema of 20 or 25 ℥ of tincture of opium in a little starch repeated if necessary two or three times in twenty-four hours will usually suffice. A large proportion of cases will do well under this simple treatment without further medication.

In India the question will often arise, Is quinine useful or necessary? I think that in mild cases in young patients newly arrived, and who have not suffered from malaria, it is not called for, particularly if the temperature is not high. When the opposite conditions prevail, more particularly when the rise in temperature begins at or about 1 P.M., I believe it should be used; it unquestionably distinctly lowers the temperature, a point of unspeakable importance. The long-continued high temperature of this fever, continued as it is for weeks, from its effect on the nervous system, and, above all, on the muscular structure of the heart, is in itself a great danger, and a frequent cause of death. Any means, therefore, which, without aggravating other symptoms, tend to lower temperature, are not to be lightly esteemed. If you will look once more at the temperature chart of the case from India, you will see that from day to day the temperature was much reduced by the cold bath. Cold effusion was, as you know, much used by the famous Dr. Currie, of Liverpool, in the fever which prevailed in his day, no doubt typhus—a fever so contagious that Currie, in taking the temperature of his patients, contrived a thermometer curved in such a way that he could read the index standing behind his patients without the danger of their breath. Jackson too, the prince of army surgeons, used cold water, particularly the cold douche, in the camp fevers of his time, and with great success.

In Germany and in France the treatment by the bath has been revived, and the effect has been, according to

Brand, Liebermeister, Jüngensen, and others, to reduce the mortality from 15.4 per cent to 3.1.

According to Broadbent, it has not been so successful in England. Perhaps it has not been found practicable to carry it out either in public or private practice in the face of a prejudice against it on the part of the people, and no doubt also on account of the sacrifice of time it demands.

With the cold bath some of the Continental physicians combine very full doses of quinine. Different authorities take different temperatures as their standard for the use of the bath—from 102.1 F. to 103°. The patient by some is placed in a bath at a temperature ranging from 65° to 70° F., kept in it for ten minutes, and the emersion is repeated when the temperature rises again, perhaps three times in twenty-four hours. A little brandy is recommended before and after the bath; the patient is dried and carefully but lightly covered.

The method which finds most favour with British practitioners, and is the one strongly advised by Broadbent, is to place the patient in the bath at a temperature of from 80° to 90° F., and to cool rapidly down to 70° or 65°; if the patient's temperature is high, the cold water should be poured over the head. It is immediately after the bath that the administration of quinine is advised, in full doses of not less than 10 or 12 grains at short intervals, until 30 or 40 grains are taken. If there is irritability of the stomach, 20 grains with a few ℥ of laudanum may be given by enema. I have already mentioned that in this way it

acts effectively. Broadbent adds a word of significant caution on the combination of quinine and the bath, viz. that he has twice seen tetanus follow their use, although both patients recovered.

In my lectures on the treatment of malarial fevers I have pointed out that quinine is often abused by being given in excessive doses ; this may have been the cause of the formidable symptoms mentioned. I feel convinced that the same good end may be obtained by smaller doses.¹

¹ M. Bouchard uses tepid baths which gradually grow cold ; he keeps the patient's shirt on, and uses as much water as will cover his shoulders ; so arranging that hot or cold water can be easily added, and surplus water allowed to run off. The rectal temperature is to be ascertained before the bath is given. The water is lowered two degrees in temperature every ten minutes, until it has fallen to 86° F. ; the patient is kept in the bath at this temperature for ten minutes ; he is then well dried, a dry shirt is put on him, and he is wrapped up in a warm blanket. These baths are given as soon as the diagnosis is made, and are continued until the rectal temperature is maintained at 37.5 cent. (98.6 F.) Eight baths should be given in twenty-four hours, until towards the end of the fever, when three or four are found sufficient. It is claimed for this method that it is agreeable to the patient, that the temperature is effectually lowered, that it generally prevents stupor. Delirium, ataxy, and headache are greatly modified ; dryness of the mouth and tongue is relieved. When temperature is not sufficiently relieved, Bouchard adds quinine to the treatment. It is admitted that the frequency of the baths and their duration are very trying, and that when quinine is given with the baths, certain "slightly disagreeable results are apt to follow." If syncope happens in or after the baths, they are to be discontinued. In pulmonary complications they should not be given.—*British Medical Journal*, No. 1319, 10th April 1886.

There is another method of treating enteric fever, which has been very strongly advocated by the late Surgeon-Major Moffitt, the brother-in-law and companion of Chinese Gordon in the campaigns that made that lamented officer so famous. Dr. Moffitt had a large experience of this disease, both in China and India, more particularly at Mount Aboo. Not satisfied with the results of the usual treatment of enteric fever, he made an extensive trial of turpentine, given, from the onset of the disease, not merely as a remedy against hæmorrhage, for which purpose its value has long been acknowledged. Dr. Moffitt claimed for this remedy, used in this way, that it prevented meteorism, checked diarrhœa, and prevented hæmorrhage. I have looked carefully through the record of his cases, kindly placed at my disposal, and think the treatment was very successful, the mortality less than under the old method, and that it is worth a more extensive trial in India.

It is after the end of the second week that we have to expect one or more of the complications mentioned. Lung complications will evidence themselves by a rise in temperature and a quickening of the respiration; a sudden fall of temperature indicates hæmorrhage. The favourite remedy for this complication in this hospital is ergotin hypodermically; from 2 to 6 minims of a solution of ergotin of the strength of a grain in 2 minims of distilled water, or the liquid extract may be given internally in doses of 60 minims, and repeated in half an hour several times, until some effect is pro-

duced. Of turpentine for this purpose I have already spoken, the dose is 10 to 15 minims.

From 20 minims to ʒss. of tincture of opium will control the peristaltic action of the bowels, and for this purpose is strongly advised by Broadbent and others as a powerful means of aiding the above measures.

Should symptoms of perforation or peritonitis set in, opium in full doses is the only remedy that can relieve or afford the smallest chance of recovery. Tympanitis, if at all excessive, is a source, not only of discomfort to the patient, but of danger by provoking hæmorrhage, and must be met in like manner by opium and small doses of turpentine.

Diarrhœa, when the motions exceed three a day, is best restrained by the same invaluable remedy given, as already mentioned by enemata.

Lung complications, congestion or pneumonia, are best met by turpentine stupes—turpentine internally and stimulants. As in all fevers, the condition of the bladder requires attention, particularly if there be a tendency to stupor, and bed-sores should be guarded against by constant watchfulness. The return to the use of solid food should be very gradual, and not attempted until convalescence is far advanced; no more fatal error can be committed than to neglect this cardinal rule of treatment.

The rules for the use of *stimulants* in enteric fever have been much disputed. It is a fact that many cases do well without wine or spirits from first to last; but to insist, as some do, that they should never be used,

is, in my opinion, a grave mistake, and one that if acted on in military practice, particularly in men who have indulged in spirits freely, would in many cases be fatal. In drunkards they may be required from the first, in others only when signs of weakness set in. When the heart's action becomes weak, the first sound indistinct, and the pulse flutters, they are urgently needed; again, a dry tongue with sordes in mouth and teeth are signs in this as in other fevers which loudly call for them; a high temperature added to the above symptoms is an additional reason for their use. A careful physician will watch the effects closely, and will find in the improved aspect of the patient, the better action of the heart, a pulse increasing in strength and diminishing in frequency, with a fall in the temperature, the justification for their use. It is impossible to give a hard and fast rule as to quantity—this must vary with the requirements of each case; but whatever the stimulant be, whether brandy or whisky, it should be given after food.

Enteric fever "is the most treacherous of all diseases" (Aitken). Keeping this continually in mind, a prudent practitioner will be guarded in his *prognosis*, remembering the many complications which may arise in its course, and at any time give a grave aspect to a case, when, to all appearance, it may have been progressing favourably; it leaves those who have emerged from it in a state of mental childishness, which often lasts for a considerable time after apparent restoration to health (Jenner), and Professor

Aitken adds a maxim which from a pretty large experience I can confirm, and which I commend to your attention ; it is this: "No man can be considered as fit for Work, or for General Military Service, for three or four Months after an attack of severe Enteric Fever."

Before I pass from this important subject, let us see whether anything can be done in the way of *prevention* to guard our young soldiers from this destructive disease. Climatic causes are without the range of preventive medicine, except in so far as we can modify the effects of such causes by attention to the general laws of health applied to the peculiar nature of the climate with which we have to deal. We can by attention to such laws construct the houses in which we live, the clothing we wear, the food we eat, the water we drink, so as to protect ourselves against influences which tend either directly to cause disease, or indirectly to predispose to it ; and we can by such means as drainage, both surface and subsoil, in the neighbourhood of our dwellings, do much to banish well-known causes which either create or aggravate disease, and still more by the careful removal of every kind of filth and decomposing animal and vegetable matter. We can attend to the due regulation of barrack latrines, to the purity of the water supply, to the sources from which milk and other articles of consumption are obtained. We can by every channel open to us, by wise and reasonable representation, keep before the minds of the authorities the health conservancy of the native towns, bazaars, and neighbouring villages

frequented by our men. Gentlemen, it often astonishes me to hear this last item of prevention sneered at and undervalued, not only by men outside the profession, but by sensible men within it. I can tell you of a city in England, "no mean city," but one of much historical interest, where, until very recent times, the carriage ways within its walls could not be disturbed to mend a gas-pipe without the almost immediate appearance of cases of scarlatina, sometimes of a malignant type, in the houses near the opening. For ages this city had been riddled with cesspools, and when some attempt was made to drain it, the work was so carried out as to aggravate the evil: the death-rate in this city was within living memory one of the highest in the kingdom. When, therefore, we are sneered at for teaching by pen and speech that the soil in and about Indian cities, bazaars, and villages, is sodden with excrementitious matters, the accumulation of ages, and that such a condition of things is a fertile source of disease, we must bear the reproach of ignorance with patience.

In my evidence before the Royal Commission that inquired into the health of the army of India, I pressed on the Commissioners the importance of making a greater use of hill stations for young soldiers than was then the practice; that the proper use of such stations was to preserve health, not to cure disease. It unfortunately happened that when hill cantonments were first established, sanitary precautions were neglected. It was thought that elevation above the heated plains, mountain air, and so on, would be enough; and that

hygienic measures, the necessity for which on the plains was not denied, at least in words, might with safety be neglected. A fatal error, as now acknowledged. I do not say that hill stations alone, however well selected and cared for, will suffice entirely to protect our young soldiers in the first years of their Indian service from the disease that is so destructive to them ; but I do say, that if, on first arrival, they are quartered on hill stations properly selected, lodged in suitable houses, constructed on hygienic principles, and clothed in accordance with the demands of the climate, and healthfully occupied, we may see a marked diminution in the prevalence of a disease that more than any other to which the human race is liable, may be classed among those that are distinctly preventable.

LECTURE VI

FEBRICULA AND RELAPSING FEVER

THIS form of fever is more aptly designated by the term Ephemeral than that of Febricula in general use. Systematic writers are puzzled how to classify it, as it cannot be traced to the action of any specific poison. In hot climates it is commonly regarded as a kind of "seasoning fever," chiefly attacking young persons of both sexes on first arrival after imprudent exposure to a hot sun. Young officers and recruits kept too long at morning drill are prone to suffer from it; the latter more especially, after many hot and sleepless nights in barracks, swarming with mosquitoes and other insects, and indulgence in hot curries, to which they are not accustomed, with perhaps some of the pernicious drinks to be found in every bazaar. Although of short duration the fever is often very severe, particularly in young men of a sanguine temperament, the temperature rising with great rapidity to 103° or 104° F., with a full, frequent pulse, a foul tongue, severe headache, lumbar pains, hot and dry skin, great thirst, and scanty high-coloured urine. Defervescence sets in from 12 to 24

hours, the febrile condition rarely lasting more than 30 hours. In no febrile affection does the urine diminish so quickly as in this (Parkes): "it presents the very type of the so-called febrile urine." The specific gravity is very high (1035-1037); it is never albuminous. With the fall of temperature the quantity of urine increases. I have occasionally seen cases in delicate young men in which the defervescence has not been so sudden, the temperature remaining several degrees above normal for several days, with slow convalescence, requiring a change to sea or to a mountain station before return to duty.

The diagnosis is not difficult. The rapidity with which the temperature attains its maximum, the brief duration of the febrile state, and the absence of the progressive weakness preceding the rise of temperature, mark it off from enteric fever. With any malarial fever it cannot be confounded, as beyond a slight difference between morning and evening temperature; there is no periodicity in the symptoms. The treatment is simple: confinement to bed, the exhibition of a mild purgative; a solution of the citrate or acetate of ammonium, with acetate of potassium (2 drachms of each, with 4 drachms of spirit of nitre and camphor water, with a little syrup to 8 ounces, make a pleasant diaphoretic mixture). Great relief is obtained from tepid sponging, and the use of ice to the head, the free use of diluents, and low diet.

The German equivalent for our relapsing fever, viz. *Typhus Recurrens*, better expresses the phenomenon from which this fever takes its name than the one by which it is known with us.

I may preface what I have to say on the subject of this fever with the remark, that I never saw an example of it in India in the person of a European, civil or military. British soldiers there are exposed to many causes of disease, but are not in the condition of those who are the usual victims to relapsing fever; they cannot be classed with those who are "poor and ill-fed, who live miserably"; and when the disease prevails among the native population as an epidemic, they are rarely brought into contact with the sufferers.

The cause of this disease is not known. From the often observed fact that it treads in the footsteps of famine, it takes the name by which it is generally known in Ireland, viz. Famine Fever. It is beyond doubt that scarcity of food, overcrowding, and want of cleanliness of place and person are at least predisposing causes; these being the conditions most favourable to the genesis and spread of typhus fever, it is not surprising that they are sometimes, as in Ireland, found together, although they are said by Parkes, to be "altogether distinct."

Being a distinctly contagious disease, overcrowding, the usual concomitant of famine, favours its spread.

It has been seen in an epidemic form in the Punjab, and in 1877 it prevailed extensively in the Bombay Presidency.¹

¹ My friend and successor, Deputy Surgeon-General David B. Smith, informs me that he had to do with a fatal outburst of this fever, attended with great mortality, in the Delhi Prison. It was distinctly traceable to an insufficient dietary in the prison. Many

Anatomical Characters.—Enlargement and softening of the liver and spleen are the most constant of the morbid changes; the spleen attains to a size nearly as great as in malarial fevers; the blood is often found in a fluid state after death; no other organ seems to present any notable morbid change.

In 1872 Obermeier detected a spirillum in the blood of those affected, which now goes by his name, *Spirillum Obermeieri*, seen always in the stage of pyrexia, disappearing with that stage, and again reappearing at the period of recurrence of the fever. This spirillum was also carefully observed by Dr. Vandyke Carter during the Bombay epidemic of 1877, already referred to. Is this spirillum the cause of the fever? Murchison and Bastian do not admit that it is. Professor Aitken is of opinion that the weight of evidence seems in favour of the belief that the spirillum found in the blood in this fever is non-essential, and merely an epiphenomenon; or as Murchison has put it, the soil is suitable for its development during the febrile process, and unsuitable when that process is complete. Carter himself, having failed many times to transmit the disease by inoculation in monkeys, allows that the point is doubtful. Certain it is that the curious appearance and disappearance of this spirillum may be accepted as an infallible diagnostic mark of relapsing fever.

We have relapses in many diseases, very notably in typhoid fever; excluding malarial fevers which recur of the prisoners had previously suffered from scarcity of food. Numerous examples of the same kind could be quoted.

with clock-like regularity, to which the term Relapse is not applicable, there is no other disease in which convalescence having to all appearance not only set in, but being complete, after 5, 6, or 8 days of ardent pyrexia, with an apyretic period lasting from 5 to 7 days, recurs again and goes through the same phenomena as in the first attack, except the fever under notice; hence its name, Relapsing or Recurrent Fever. And this not only once or twice, but it may be many times.

The *symptoms* are well marked. Those of invasion are much the same as in other fevers, viz. prostration, headache, pains in back and limbs, becoming more severe as the fever develops, lassitude, nausea, sometimes vomiting. The prostration increases, rigors set in with severe headache and giddiness, driving the patient to bed; the skin becomes intensely hot, the temperature rises to 105° F., and sometimes a degree or two more; the face is flushed and anxious; the tongue at first moist with a thick yellowish-white fur, later on becomes dry and even black; thirst is intense, and the pulse ranges from 110 to 140; the epigastric tenderness and fulness are often as well marked as in severe remittent fever, and the vomiting as urgent; the patient is restless and complains bitterly of rheumatic-like pains in his limbs and joints, a condition of things like acute rheumatism, all the more that the patient sweats without relief; the temperature curve is peculiar, while the ascent is not so quick as in malarial fevers, it soon attains its maximum, the fall to the normal or below it at the period of defervescence taking place very rapidly. When the

fever recurs the ascent to the maximum is again rapid, and the fall equally so. Jaundice is generally present, but bile is abundant in the stools. The bowels are sometimes confined, but diarrhoea is common, and in Asiatics almost invariable.

On the fifth, seventh, or eighth day a crisis sets in, usually suddenly, ushered in with profuse sweating, with diarrhoea, and often epistaxis and hæmorrhage from the bowels, and a rapid fall in the temperature and relief of all the distressing symptoms; almost invariably this condition of apparent convalescence is maintained until the fourteenth day, reckoning from the first onset, when the pyrexia and other symptoms recur, and this second paroxysm goes through the same phenomena as the first. The relapse seldom exceeds 5 days, and its duration may be a day or two less, and in some it may not exceed 24 hours. As a rule patients have seldom more than one relapse, but two or more are not uncommon.

There is a tendency in relapsing fever to sudden death (Aitken); this is not an infrequent event in Asiatics who have been reduced by scarcity of food, and patients so reduced frequently succumb to the copious diarrhoea of the crisis. The mortality among Asiatics reduced by famine who are attacked by this disease is increased by the almost impossibility of supporting them by the most careful diet. Nutrition is in fact impossible from the fatty degeneration of the lacteals, as shown by the researches of Dr. David Cunningham in the last famine in the south of India. Even in Europeans, under the most favourable conditions, convalescence is

very slow, and in Asiatics it is much protracted. The sufferers remain long in a weak state, and often suffer from severe pains in the limbs. Dr. Aitken refers to a form of ophthalmitis, described by Drs. Mackenzie and Anderson of Glasgow, as seen in that city during the prevalence of relapsing fever, occurring sometimes during the fever, but more frequently after it, hence named by Mackenzie "post-febrile ophthalmia"; seen in two forms, an active inflammation of the shell of the eyeball and iris, or an amaurotic state, due to congestion of the choroid and iris. In Asiatics sloughing of the cornea is not uncommon as a sequel of this fever as well as of cholera, apparently from a mere failure of nutrition.

Treatment.—There is no specific treatment for this fever. In the form in which the disease is seen in India, it resolves itself into careful dieting of the sick. For the reason given above this in the native races, reduced by starvation, is always a difficult, often an impossible thing to accomplish; diarrhoea, with them almost always present, is aggravated by the presence of food which is not digested and absorbed, and this easily passes into intractable dysentery. Milk in small quantities often repeated, thin arrowroot gruel, which I have found to be the safest and most easily assimilated diet for patients emerging from the collapse of cholera, is equally suitable for nourishing the sick in the condition of which I am speaking; with chicken-tea, soft-boiled eggs, and white wine whey. In robust Europeans little medication is required. The bowels should be relieved if constipated. Vomiting is best combated by the use of ice, and the

external use of mustard to the epigastrium. Aitken advises 5 grains of calomel and 1 of opium in severe cases. Headache is relieved in those who can bear the remedy, by the application of a few leeches; and in the more weakly by blisters to the nape, a remedy not applicable, for fear of sloughing, in half-starved Asiatics. The action of the kidneys is promoted, and the risk of uræmic poisoning lessened by the use of nitre, given from the first (Murchison), whose formula is 1 or 2 drachms of nitre dissolved in 2 pints of barley-water, acidulated with a drachm of dilute nitric acid, and sweetened; this can be taken in 24 hours. If suppression of urine takes place, the hot air-bath and saline diuretics must be used, and active purgation with compound jalap is urgently called for. For the jaundice, which sometimes is present, Murchison recommends the addition of hydrochloric acid to the nitre mixture given above. Anything like active purgation at any stage of the disease would be fatal to sufferers among the native races; in their case the chief difficulty is to control diarrhœa or dysentery, as the case may be. Our chief reliance must be placed in some of the preparations of opium.

DENGUE.

The term Dengue, in universal use to designate the form of fever I am about to describe, seems to have originated in the West Indies. Many derivations have been assigned to it, most of them fanciful. It is certain that among the negroes there, Dandy Fever was a common

name for it, supposed to refer to the peculiar gait of those affected, suggesting to the negro mind the idea of affectation or conceit. Dengue is supposed to be a Spanish corruption of this whimsical term. Dr. M'William, R.N., tells us that a fever known by the name of Dandy Fever prevailed throughout the West Indian Islands in 1830, and preceded an epidemic of yellow fever; and the same author mentions that a similar fever appeared at Rio de Janeiro, at Pernambuco, and Bahia, and went by the trivial name of the Polka; its appearance being nearly coincident with the introduction of the well-known dance of that name. This polka fever, in like manner, preceded an outburst of yellow fever. The term Dandy Fever, however, was in use among the negroes of the West India Islands long before the occasion referred to by Dr. M'William.

The College of Physicians have sanctioned the term Dengue, by admitting it into the nomenclature of diseases. In some parts of the United States it became popularly known as Break-bone Fever, with reference, no doubt, to one of its most painful symptoms. *Scarlatina rheumatica* (Copeland) is another name derived from the peculiar rash which appears in the course of the affection, and the pains in the limbs above referred to; in Calcutta it is often spoken of as "Goodeve's red fever," that physician having described the disease as he saw it there in 1844.

It seems impossible now to trace the origin of this fever; many believe that it first appeared within the yellow fever zone. The fact that outbursts of this fever sometimes are the precursors of an epidemic of yellow

fever, within the limits of that zone, gives some colour to this belief. Be this as it may, the disease has prevailed far outside the limits of that zone. Without giving you in detail a list of the recorded epidemics which have appeared in various parts of the world, I may mention that it was seen in Philadelphia in 1780, and described by Dr. Rush of that city. It was then it appears to have gained its popular name of Break-bone Fever. So far as can now be ascertained, India was first visited by it in an epidemic form, 1824. It raged in Burma among the troops engaged there under Sir Archibald Campbell, from there it passed to Calcutta, and thence over a wide area. It was seen and described in the second volume of the *Transactions of the Medical and Physical Society of Calcutta*, by Drs. Twining, Cavell, and Mouat. The last-named physician saw it at Berhampore, and described it under the name of Epidemic Fever. His description leaves us in no doubt that the fever was Dengue and no other; he noted the suddenness of the attack, the redness and watering of the eyes, the acute pain in the joints, rendered excruciating on the slightest touch, the scarlet or crimson efflorescence on the surface; its ephemeral duration; its not requiring blood-letting; its sparing neither age, sex, nor habit of body; its seizing the acclimated as well as those recently arrived, symptoms, which, in his opinion, stamped it at once a different disease from the remittent or endemic fever of Lower India.

Dengue was again seen in Calcutta in 1844, when it was described by Dr. Goodeve in the ninth volume of the

same Transactions, under the name of a Peculiar Form of Eruptive Fever. Dr. Goodeve evidently was not aware at the time he wrote that the affection had ever been seen in India before. It is, however, to be noted that this careful observer makes no mention of the articular pain which is characteristic of true Dengue.

The disease appeared at Zanzibar in 1870, following an epidemic of cholera, from thence it was introduced into Aden, and was carried to Western India, spreading over a wide area, and in 1872 was once more epidemic in Calcutta, where it affected a large part of the population of all races and ages. Dr. Charles, then one of the professors in the Calcutta Medical College, made it a subject of careful study, and his Treatise on the disease you will find in the Library here. It will be seen that Dengue has travelled widely, and so far as I have been able to gather from the sources of information open to me, its symptoms and behaviour have been much the same in all places of its visitation.

Dengue is usually seen in an epidemic form, and may be defined as a contagious febrile affection which impartially attacks all races, both sexes, and all ages. Its invasion is sudden, attended with headache, red and watery eyes, some redness of the fauces, without pain or difficulty in swallowing, severe muscular and articular pain, with much suffering, general distress, prostration, sleeplessness and restlessness; with pyrexia, the temperature rising from 100° to 103° , and in exceptional cases to 105° F., with a scarlatina-like rash; generally attacking once, a rule subject to many exceptions, the fever having a

remittent tendency, with a liability to relapse. The mortality trifling.

Symptoms.—The period of incubation is uncertain; it may be only a few hours, or five or six days. When a disease is epidemic there must always be doubt and uncertainty on this point. Early in the course of an epidemic the invasion is observed to be almost always sudden; later on the symptoms which usually precede an attack of fever are noticed, languor, lassitude, loss of appetite, nausea, and such like familiar symptoms. The attack is often in the night; the patient awakes with headache, pain in one or more joints, in the back, flying from one joint to another, now in the fingers or toes, then in the thighs, or in the arms, wrists, or ankles; often the whole body aches in an intolerable manner, and he tosses in the vain effort to find an easy position; the eyes smart, are red and watery, the face is flushed and swollen, there is thirst, the skin is hot, the tongue varies, generally with a white fur, always red at tip and edges, the papillæ prominent, showing through the fur strawberry-like. Prostration appears early; the pulse is quick, always compressible, the urine usually normal in quantity, colour, and specific gravity, without albumen, or deposit on cooling; some observers, notably Cavell and Mouat, speak of it as scanty and high coloured, probably in the cases where the temperature was high. The bowels are usually costive; vomiting is not uncommon, and if the invasion quickly follows a meal, almost invariable. The restlessness, “universal soreness,” and general distress often amount to anguish.

As already said, the temperature soon reaches 100° , 103° , and it has been seen as high as 106° F.—a temperature indicative of danger, particularly in the hot season.

The rash appears generally on the second or third day ; Mouat has noticed it “from the first.” I observe that neither Twining, Cavell, or Mouat, the physicians who saw and studied the disease in 1824, speak of the appearance of a rash twice in the course of the fever ; while Charles describes two, viz. what he calls the “initial rash” of a scarlatina-like character, appearing on the second day or thereabouts, and a “terminal rash” of a measly appearance, showing itself about the fourth or fifth day. This initial rash was far from being invariable in Dr. Charles’ cases ; indeed, he says it was absent in fully one-third of his patients. It is difficult, at this distance of time, to determine whether this double rash was a peculiar feature in the epidemic of 1872, or whether, from its transient nature, it escaped observation in that of 1824. This initial rash sometimes covers the entire surface of the body, at others only the face, or some other part of the person ; it may be of a bright vivid red colour, or of a duller red ; it disappears on pressure with the finger, and is attended with itching which materially adds to the discomfort and restlessness of the sufferers.

In children the rash cannot always be distinguished from *urticaria*. The initial rash when present usually disappears entirely in about twenty-four hours, and sometimes fades away in half that time. Still, some hours may elapse before the temperature falls, and the rheumatic-like pains and discomfort survive the fall in temper-

ature for some days. According to Charles, the terminal rash appears usually on the fourth day, other observers have seen it on the fifth and sixth day; this terminal rash is very evanescent, and consequently it escapes observation. There is no fever during the eruptive period as a rule, although Mouat in some of his cases observed "a secondary fever" of short duration at the period of efflorescence; the rash rarely lasts more than forty or forty-eight hours. As already said, this eruption resembles measles, but even in the same epidemic it may differ in different persons; sometimes it resembles that of scarlatina, or urticaria, in others lichen, and the same observation was made by Mouat.

The duration of the disease is about eight days, but the convalescence is slow, extending in many cases over months before health is restored.

Relapses both of the fever and rheumatic pains occur, with prostration. These relapses may sometimes be traced to imprudence on the part of the patient, errors in diet, or too early attempts to resume work. Twining mentions a severe relapse which followed a cold bath, before convalescence was complete.

The complications are catarrh, epistaxis, swelling of the lymphatic glands, ptyalism (easily provoked by mercury), of which Twining gives an example—orchitis, which is very rare.

Diagnosis.—Little need be said on this point. There are only two diseases with which it can be confounded, and these only by the careless or the ignorant, viz. scarlatina and acute rheumatism. I never saw a case of

genuine scarlatina in India. I have heard that cases of it have been seen at some of the hill stations of Upper India ; if so, they were probably imported from England. Certainly no epidemic of scarlet fever has ever been seen in India. Dengue, when seen there, is always epidemic. In scarlatina the throat symptoms are among the first to attract notice ; the redness spreads from the tonsils to the palate, uvula, pharynx, and epiglottis, and ulceration is common, which is not confined to the tonsils. The throat symptoms in dengue seldom go beyond a slight degree of redness, with little or no pain or difficulty in swallowing. In scarlatina the urine from first gives evidence of much nitrogenous waste, and as desquamation begins albumen is usually present ; in dengue the urine is normal. The rheumatism of scarlet fever is rarely seen before the end of the first week ; in dengue it is one of the earliest and most marked of the symptoms. The rash of scarlatina appearing on the second day lasts for five or six days, that of dengue only a few hours.

Dengue can hardly be mistaken for acute rheumatism, which is never epidemic ; the latter is usually preceded by signs of deranged health ; the pyrexia is more intense ; the acid sweats and the long duration of the disease mark it off with sufficient distinctness from dengue.

Treatment.—If we look to the record of the effects of what is called active treatment, in other words, bleeding, leeching, and purging, left us by the authors to whom I have referred, viz. Twining, Cavell, and Mouat, you will not find much to encourage you to revert to a

system of which it is not too much to say that it was worse than the disease. The simple truth is, dengue has a certain more or less definite course to run ; we cannot by any known means cut this course short, but we may do much to mitigate the patient's sufferings, to shorten the period of convalescence, and restore him to health.

If the attack comes on shortly after a meal, a mustard emetic will give relief, and spare the patient much nausea and efforts to rid the stomach of an undigested meal. Active purgation does no good, the movement of the affected parts adds to the patient's sufferings, and free purging only promotes prostration without any compensation. Aconite, in drop doses of the tincture given every ten minutes, until a full medicinal dose has been taken, will do much to lessen headache, to calm restlessness, and to promote action of the skin. Dr. Charles' favourite remedy is belladonna, which may be given according to his formula, viz. a drachm of the tincture, and 5 drachms of syrup of orange, of which a sixth part should be taken every hour by an adult until three doses have been given. In severe cases the dose may be doubled, the effects being watched. The affected joints should be smeared with a liniment composed of one part of chloroform to seven of belladonna liniment, and wrapped up in cotton wool. When the temperature is high, sponging of the surface first with tepid water, and then with water 15° below the temperature of the surface will be grateful to the patient ; and when headache is intense ice may be applied to the head. When the temperature rises, as it may in rare

cases, to 106° , the question of the use of the cold bath may arise. The safest course is to place the patient in a bath at 90° , and to cool it down to a temperature 15° below that of the surface when the patient was placed in it, ice at the same time being applied to the head. Solid food should not be given until every trace of pyrexia has disappeared. Quinine and tonics, such as the citrate of iron and quinine, are then useful; and the syrup known as Easton's (the *Syrupus Ferri, Quiniæ, et Strychniæ Phosphatis*) is particularly applicable.

LECTURE VII

YELLOW FEVER

SYNONYMS.—*Hæmogastric Pestilence*—*Typhus Icterodes*—*Synochus Icterodes*—*Causus*—*Fievre Jaune*, French ; *Galbus Fieber*, German.

The literature of the subject is immense. Owing to the ravages it has caused it has not only long engaged the attention of the medical world, but also of the various governments whose fleets and armies have suffered from it.

Yellow fever was unknown before the discovery of the New World. It is said to have a habitat of its own, viz. the shores of the Gulf of Mexico, the northern and eastern shores of South America, and the islands in the Caribbean Sea. Its ravages have not been confined to this habitat ; it has visited many regions outside its limits, although incapable of establishing itself for any length of time as an endemic disease. Many places which, in the early part of this century, were scourged by it are now free from its ravages ; towards the close of last century it often prevailed in the northern cities of the Atlantic coast of the United States, where it is now

never seen. In 1797-98 New York, Boston, Philadelphia, and Charleston suffered. In 1800 it again ravaged Boston, Baltimore, and other parts of the Union. Cadiz suffered from it in the same year, and various parts of Spain throughout 1804. Gibraltar had no less than four epidemics between the years 1810 and 1828; it was towards the end of the epidemic of this last-named year that the famous military surgeon Hennen perished. Lisbon, an uncleanly city, has had two visitations, the last in 1857. Vera Cruz and the Havana rarely escape an annual visit; at both places the disease is endemic in the strictest sense of the term. Memphis, Tennessee, in lat. 35 N., has suffered three times. Like many other cities, it grew up without the guidance of a sanitary engineer, with the usual result; every house sat on its own cesspool, until the terrible discipline of three epidemics of yellow fever aroused the inhabitants to a sense of their danger, and led to a thorough measure of sanitary reform.

Yellow fever and the West India Islands are inseparably associated in men's minds, and not without reason, for the graveyards of most of them have been fed fat with its victims. Yet it is equally true that individual towns and islands have enjoyed long intervals of freedom from its attack. Thus at St. Domingo there was no yellow fever between 1775 and 1785; none at Grenada between 1763 and 1793. The islands of St. Kitts, St. Vincent, and Barbados were so healthy previous to 1793 "that soldiers fresh from Europe, notwithstanding their debauched lives, enjoyed good health." The

principal medical officer in the West Indies for the time has placed it on record "that between 1785 and 1792 only one officer died out of four regiments quartered in Barbados." The first recorded outbreak of the disease in the West Indies was in 1647. It was in the year 1793 that the pestilence reappeared after a long interval of freedom; always endemic there, it breaks out occasionally in an epidemic form with much violence, and generally between the months of May and August.

It is a disease of tropical and sub-tropical climates. Within such limits it finds the conditions most suitable for its action in maritime cities slightly above the level of the sea.

Humboldt's dictum that yellow fever cannot exist at an elevation of 3000 feet above the level of the sea has not stood the test of experience. On three occasions it has been introduced and been fatal at the military post of Newcastle, in Jamaica, which is 4000 feet above that level. This post is situated on a spur of land falling rapidly from the Blue Mountains under St. Catherine's Peak, southwards to the villages and ravines which connect it with the low country. The cantonment was not well planned, and, until warned by the visitations of yellow fever I have mentioned, the sanitary arrangements were defective, and the disease, once introduced, found, in a limited area, crowded with buildings, under bad conservancy, the conditions most suitable for its destructive action. Under better arrangements this important post has not suffered from the disease since 1860.

In the United States the highest level to which the

disease has attained is 262 feet. I have already mentioned Vera Cruz as a place which is the very home of yellow fever; it has never prevailed at Xalapa, which is in the same latitude as Vera Cruz, but 4350 feet above the sea.

What is the *cause* of yellow fever? Dr. Parkes has classed it among fæcal diseases. I have been in the habit for years past of placing before those who have preceded you much evidence, gathered from many sources, in support of this opinion. I am now able to compress into much smaller space evidence which, to my mind, is very convincing on the point. My colleague, Professor Aitken, in an introductory address to the surgeons on probation in the Army Medical School, afterwards expanded and published under the title of *The Doctrine of Evolution in its Application to Pathology*, in the course of his instructive and interesting argument quotes largely from what Dr. Charles Creighton has written on the *de novo* origin of some specific fevers. After some observations illustrating the fact that yellow fever appeared in the seventeenth century as a new disease, and showing that for more than a century after the Spanish conquest of America, and for many years after the English and French colonisation of the West India islands there was no yellow fever, and that when it did come it was something different from the ever present malarial fever; and some remarks on its peculiar geographical distribution; still quoting Dr. Creighton, Professor Aitken goes on to say, "There is only one thing that covers its (yellow fever) history, geography, and the remarkable changes

in its distribution, and that is the slave trade. The localities where it is, or has been endemic or repeatedly epidemic, are those found to be the creeks, wharves, and low shipping quarters of the ports of debarkation of the slave trade, together with a few much less endemic but not less significant spots in Spain, and on the west coast of Africa—the places to which vessels engaged in the contraband slave trade had gone on their return voyage. After showing that Peru offers only an apparent exception to this rule, inasmuch as the coolie trade across the Pacific has many points of resemblance to the old African slave trade, reference is made to the fact that after the disastrous outbreak of yellow fever at Barcelona in 1821, the French Government caused an inquiry to be made which gave the first clue to the connection between yellow fever and the slave trade. Dr. Auduard, who conducted the investigation, came to the conclusion ‘that it was a peculiar form of typhus due to the emanations from the putrid dysenteric discharges of the negro; and the fever owed its well-marked specific type to the fact that the matters which excited it could be traced to the negro body.’ It was Auduard’s opinion that it was when the discharges were *fermented* that they produced in others a typhus of a peculiar type. The slaves themselves did not suffer from yellow fever, but they suffered much from dysentery and from the ‘horrors of the middle passage,’ so that a slave ship would arrive at her destination with no contagious fever aboard but saturated with the filth of her human cargo, out of which the specific yellow fever ‘*came into being.*’ These con-

ditions must have arisen often at all the Spanish ports where yellow fever was almost a yearly occurrence ; and the whole history and geographical distribution of yellow fever in America are of the same description, so that sea-ports where cargoes of slaves had been landed year after year became so saturated with the peculiar filth of the trade, that the wharves, landing-places, and shipping quarters of these ports became foci of infection. In some places, such as Vera Cruz, the poison seems to have become peculiarly fixed in the soil, so as to defy all attempts to get rid of it ; but in the great cities on the Atlantic seaboard of the United States the fever was practically eradicated soon after the importation of negroes ceased. During the sixteen years after that date (1808) yellow fever appeared only seven times in the different parts of the Union, whereas in the sixteen years preceding the abolition of the traffic in slaves it had broken out fifty-eight times. In the Spanish sea-ports also the great epidemics of yellow fever are an almost forgotten tradition."

Brazil is then shown to illustrate the same facts. There epidemics of recent date, the first in 1849, prevailed, because for some time it was the only market open to the trade except Cuba. The disease has also been established in the seaports of Peru, under like conditions, viz. by ship-loads of sickly, ill-fed, ill-cared-for Chinese. Like the negroes, the Chinese did not themselves suffer from yellow fever, but they suffered from these dysenteric and non-contagious ailments from which the yellow fever "came into being."

The case is thus summed up: "If, then, we put together the facts of this remarkable disease; when we consider that its advent into the world coincided with the rise of the slave trade; that its habitat is or has been the ports of debarkation of the slave trade, and those places in Spain and the west coast of Africa to which slave ships went on their return voyage; that its exacerbations have coincided with the most lawless period of the negro traffic; that it gained a footing in the ports of Brazil in 1849, when the slave trade flowed into that channel; and that it has become endemic subsequent to 1853 on the Pacific coast of South America, in those parts of Peru which were the seat of an infamous coolie traffic, we cannot but see in all this concurrence of testimony a proof that Auduard was right in describing yellow fever as *a peculiar form of typhus, originating at all its endemic centres in the filth of slave ships, just as he showed that it had so originated as a matter of fact in two of the Spanish outbreaks.* But if that evidence should not be enough, we have only to add the fact that the negro cannot take the disease, although it rages most in the very quarters where negroes live. The yellow fever still lurks about the wharves and shipping quarters of towns where cargoes of negroes used to be landed; and every few years, when the weather is at its hottest, it rises into a pestilence."

This is a long extract, but its importance cannot be overestimated; to my mind it sheds a flood of light on a subject which has hitherto been one of profound obscurity. It does more, it holds out a hope in which we

may indulge that in time this terrible pestilence, the punishment inflicted on mankind for this accursed traffic, may disappear.

I have now as briefly as possible to give you some evidence of its portability and introduction into places far from the spots—"the wharves, landing-places, and shipping quarters, the foci of infection."

Yellow fever has twice been introduced into Oporto, on the first occasion by a ship which entered the Douro from Rio de Janeiro, where the disease was raging. Five of the crew died of the disease on the passage; immediately after her arrival it broke out in Oporto. It is a notable fact that the custom-house officers, the first to board the infected ship, were the first attacked. In 1856 the disease was again brought to Oporto in the same manner. As already mentioned, yellow fever has twice been imported into Lisbon, on the last occasion from Rio de Janeiro. In this epidemic 5652 inhabitants perished.

One of the most authentic examples of the portability of yellow fever by human intercourse is the famous case of its introduction into St. Nazaire in 1861 by the *Anne Marie*. The disease was raging at the Havana, from whence the vessel sailed; several of the crew died of it on the passage; the ship arrived at St. Nazaire on the 25th of July, having left Havana on the 13th of June. On the 5th of August the labourers employed in unloading the vessel were seized with the disease, from them it spread to the town, causing 44 cases and 26 deaths.

The Swansea case is an equally good example. A ship, named the *Hecla*, with cases of yellow fever on board, left Cuba on the 26th of July 1865 ; fresh cases occurred on the passage. The *Hecla* entered Swansea harbour on the 19th of September, with one of her crew affected with yellow fever, and two others convalescing from the disease. The ship was moored alongside of the wharf, landed her sick, discharged her cargo, and remained in that position until the 28th, when, in consequence of representations, the vessel was removed from the dock. Between the 15th of September and the 4th of October 20 inhabitants of the town were attacked with distinct yellow fever. It was clearly established that the first sufferers were those who had intercourse with the crew, and that those subsequently attacked had intercourse with them. A ship which lay alongside the *Hecla* was affected, three of her crew having taken the disease (*vide* Eighth Report of the Medical Officer to the Privy Council). On several occasions the disease has been brought from one or other of the West India Islands into Southampton, and I had an opportunity of seeing one case of it in one of the hotels of that town, with my friends Drs. Lake and Keele ; in like manner it was imported in one of the royal mail steamers.

I must now invite your attention to some important facts, the outcome of the labours of many observers who have studied this pestilence : (1) The inhabitants of northern climates suffer more from yellow fever than those bred in warm latitudes. Thus in Blair's ex-

perience in the Demerara epidemic of 1837, while the percentage among West India islanders was 6.9, that of French and Italians was 17.1, that of English, Irish, and Scotch was 19.3, that of Germans and Dutch was 20, that of Swedes, Norwegians, and Russians was 27.7 ; (2) Those recently arrived within the sphere of its activity are most prone to suffer ; the strong and robust are more liable to the disease than those of a feeble constitution ; (3) Females are less liable to be attacked than males, and the mortality among them is less ; (4) The disease, so to speak, spares those at the extremes of life, the very old and the very young—the age of vigour between 35 and 40 is the age most prone to suffer ; (5) The pure-blooded negro enjoys an exemption from attack which admits of no doubt ; Creighton however remarks “ that this immunity is perhaps not so striking now, when the negro blood is not so pure ” ; (6) It occurs once during life, to this the exceptions are few ; (7) Outbursts of yellow fever within the so-called yellow fever zone are sometimes preceded by a prevailing mild form of fever, rarely, if ever, proving fatal, never attacking the same person twice, but giving no protection against an attack of its fatal successor ; (8) Yellow fever, when once introduced into any city, evinces a disposition to confine its ravages within a limited area, “ a tainted district,” always the most uncleanly. This is a point of cardinal importance, as regards the safety of troops, pointing as it does to immediate removal from the vicinity of the “ tainted district.” Want of attention to this peculiarity of the disease has

caused the death of thousands ; (9) Yellow fever requires a temperature of 70° F. for its existence ; "however violent it may be at any place, yellow fever is arrested from the day on which the earth is frozen" (Jones) ; (10) The period of incubation is uncertain, and appears different in different epidemics : it may extend from twenty-four hours to weeks, some say months—a doubtful statement.

ANATOMICAL CHARACTERS.

Blood.—In the days when bleeding was practised, physicians had an opportunity of observing the condition of this fluid, and describe it as being in the first stage red, coagulating quickly ; twenty-four hours later to be much darker in colour, more liquid, less disposed to coagulate, the serum yellowish, clot soft ; finally, fluid and black.

Nervous System.—In most of the dissections made at the Havana by Bellot the younger, the solar and semi-lunar plexus were found red, at some points even black, and easily torn.

The heart is invariably found in a state of true fatty degeneration, more marked than in any other disease ; the cavities are distended with dark fluid blood.

The lungs usually present few changes beyond some congestion at the lower portions.

Liver.—I invite your attention to the drawings suspended behind me ; they were made in the hospital at

Demerara, under the direction of Blair, during the epidemic of yellow fever at that place, which he has described so well. Observe the yellow colour and bloodless appearance of the cut surface. It is said that in uncomplicated yellow fever there is in this organ an absence of the pigmentation observed in malarial fever. In some of the specimens before you distinct pigmentation is visible; whether this was the result of previous attacks of malarial fever, or of a malarial element in this epidemic, I cannot say; but when you examine with the microscope the sections of organs prepared at the same time by Blair, and which are on the table for your inspection, you will observe in many of them evidence to the same effect. The liver cells you will notice are filled with fatty material, the organ, except in those who die at a very early stage, being always in a state of fatty degeneration. The gall bladder is usually empty.

The spleen is generally normal in size and appearance, thus presenting a marked difference from what is seen in malarial fevers.

The kidneys are of a brownish-yellow colour, and the malpighian corpuscles and tubuli uriniferi are filled with granular albuminoid and fatty matter, detached epithelial cells, and oil globules (J. Jones).

In Blair's drawings you will observe the mesentery is depicted of a pale yellowish or citron colour, not mentioned by any of the many authors who have described this disease.

The stomach is represented in the drawings to be intensely congested; it usually contains black vomit, the

orifices of the tubular glands are sometimes filled with a dark-coloured material, and the mucous membrane is soft, sometimes eroded. The intestines have externally a pale yellowish tint, as in the drawings before you, not a constant appearance, for other authors describe them as dark coloured, generally distended with gas, containing altered blood; according to Jones, one of the latest American authorities, "intussusception of the bowels is not unfrequent."

Symptoms. — The disease generally attacks in the night, and, like other fevers, is preceded by *malaise*; chills soon follow, sometimes passing into severe rigors, if violent they last a short time, if slight they may persist for twenty-four hours (Bellot). Frontal headache is hardly ever absent from the first, and is seen in every degree of severity; it lasts three or four days, with this there is lumbar pain, a symptom rarely absent, and "very urgent" when urine is suppressed (Donnet). Epigastric tenderness, with, in severe cases, a sensation of oppression of a most distressing nature, is a constant symptom; the organs connected with the semilunar plexus suffer most; this epigastric tenderness is one of the last symptoms to disappear. The eyes are congested and yellowish, the tongue is coated, the pulse is sometimes soft and compressible, at others hard. In the West Indies Jackson has seen it as high as 130. Dr. Lyons, in the Lisbon epidemic, noted that whenever it reached 115 the case was apt suddenly to assume a typhoid type; the same author has seen it as low as 60, without the other pyrexial symptoms in the least

abating; in such cases, however, it always maintained its force and tension. "Thus a strange combination is exhibited, a pulse at 60, and a temperature over 100° F."

The temperature ranges from 100° to 107° F., the face is congested, thirst is intense, with nausea and vomiting first of ingesta, then bile, and finally black vomit. The bowels are usually constipated, the urine is albuminous, and hæmorrhage in a more or less degree from all the mucous orifices appears. The heat of skin is pungent to the hand, and it displays the colour from which the fever takes its name, varying, as you see in the drawings exhibited, taken from nature, from light citron to the deepest saffron. This yellow colour often deepens after death. In some fatal cases it has hardly been observed; its appearance is irregular, sometimes it comes out early, and again not until the day of death. This yellow colour is not a true icterus, but depends rather upon the escape of certain colouring matters from the blood. Opinions vary as to the prognostic value of this symptom, some attaching little importance to it; on the other hand Charles Bellot, whose experience in Cuba has been great, deemed a yellow skin on the third day a bad prognostic, but after the fifth or sixth not unfavourable. Some of the older writers dwell much on certain marks, "marblings and wheals" on the skin, more particularly those who were most free in the use of lowering treatment. These patches are described as yellow, brownish, or livid, and sprinkled with petechiæ. With these appearances generally come the hæmorrhages from nose, mouth,

ears, and vagina, and the black vomit, and also a peculiar odour from the person, due doubtless to the diseased condition of the blood. To the above symptoms add insomnia, jactitation, hiccough, subsultus tendinum, delirium, and coma.

Let us look at some of the symptoms more closely.

1. *Vomiting* is early seen, first, as I have said, of ingesta, then of a quantity of fluid out of all proportion to that taken, specks are then seen in it like particles of snuff, then the whole becomes black; this is the black vomit, the *café noir* of the French. As I have shown you, vomiting in malarial remittents is a distressing symptom; it does not appear to be so in yellow fever. Blair tells us that a patient may be conversing with you, suddenly he ejects a large quantity of black vomit, and then resumes the conversation as if nothing had happened. Vomiting may appear at any stage, sometimes only at the point of death. What is black vomit? It is decomposed blood, mixed, it may be, with acid secretions from the stomach. Solution of nitrate of silver throws down a white precipitate from it; it has an acid reaction, and effervesces with alkaline carbonates; it presents under the microscope epithelial scales, nuclei, and variously altered blood discs, which are generally broken down, some few remain entire, invariably segregated, milled at the edges, with distinct central depressions. Dr. Wilson, R.N., who made the above microscopic observations at Bermuda, in 1864, noticed also another microscopic appearance; "a number of small circular cells, much smaller than

blood-corpuscles, were seen ; these were generally clear, sometimes opalescent, and they moved about freely in every direction. These cells were observed to elongate, then to assume an hour-glass contraction, and ultimately to divide into two cells." Dr. John Davy incinerated black vomit, and always found peroxide of iron in the ashes.

2. *Constipation* is the rule.

3. *Albuminous Urine*. — Within the yellow fever zone albumen is constant in the urine. In 62 cases treated by Dr. Donnet at Port Royal it was observed in all of them. It is not so constant out of this zone. Lyons found it in the Lisbon epidemic only in exceptional cases, but always in connection with a depressed condition of the system. Bile is often present. Hellier found albumen in the urine in something of an inverse proportion to the chlorides. In Donnet's Port Royal cases where albumen was abundant, there the chlorides were absent, and with the disappearance of the albumen, chlorides again made their appearance.

4. Suppression of urine is a fatal symptom, chiefly from retention of urine in the system. It is a good rule to use the catheter, as urine may be retained.

5. The range of hæmorrhages in this disease is unexampled. The blood transudes through the tissues with the greatest facility ; the gums are always soft and spongy, and blood pours out from them in large quantity. There is a form of the disease which merits the term hæmorrhagic *par excellence*. In this form blood escapes from the vagina, nose, mouth, gums,

throat, eyes, and eyelids, and the cutaneous surface. Lyons saw this form at Lisbon, chiefly among obese women, and generally those of both sexes remarkably plethoric and in the most vigorous years of life. It is a fatal form, death generally taking place in from five to seven days. If not then cut off, the same author observed that they are apt to sink into a low typhoid state. I have spoken of the peculiar smell given off by yellow fever patients; this is most notable in the hæmorrhagic form.

6. *Insomnia* is a common symptom, attended with restlessness, impatience of clothing, and a desire to leave bed and walk about. The old authors gave the name of "walking cases" to this form.

7. *Delirium* is an occasional symptom, followed by coma. But Blair tells us that patients often die with their faculties unimpaired—dying with an assurance of rapid recovery trembling on their lips.

Diagnosis.—The only disease with which yellow fever is likely to be confounded is yellow malarial fever.

Malarial fever is a paroxysmal disease.	Yellow fever is continuous.
Has a morning remission.	Yellow fever has none.
Albuminous urine. Very rare.	In yellow fever the rule.
Spleen always enlarged.	Unaffected.
Liver merely congested.	Profoundly affected.
Hæmorrhages extremely rare.	An unexampled range of hæmorrhages.
Attacks again and again.	Only one attack.
Black races as subject to attack as whites.	Negro race not affected.
Not contagious.	Highly contagious.
Amenable to quinine.	Quinine has no effect.

The difference between the mortality of the two diseases is most striking; thus, as Dr. Macdonald, Inspector-General, R.N., has recorded, out of 292 cases of malarial fevers in the West Indies, only 4 proved fatal; while out of 183 cases of yellow fever 72 died—a difference in the relative mortality of the two diseases, which, even if there were no other evidence, sufficiently stamps the one as specifically different from the other.

Prevention.—This to medical officers of the army and navy is a matter of cardinal importance. It is true that since the abolition of slavery the number of British troops in the yellow fever zone has been greatly reduced, still, it is my duty to inform you that the very first service five or six of your predecessors of one term had to perform was to face a severe epidemic of this disease at Bermuda. As for naval medical officers, they are frequently employed within that zone, and in the course of their service will often have to advise their captains on the subject. Remember that remarkable peculiarity of yellow fever to which I have already called your attention, viz. the disposition it always evinces to confine its ravages within a narrow area, “a tainted district.” Immediate removal of the troops out of this “district” is the first and most important thing to be done; it should be done at once, on the very first sign of an epidemic visitation. To wait until the men become “tainted” is an act of culpable folly, without excuse in the present state of knowledge. This fatal mistake was made at Bermuda in 1864, and was

immediately followed by a lamentable loss of life. Fourteen officers out of thirty, nearly 50 per cent, died, and out of 250 men attacked, 107 lost their lives. Warning of the coming danger was given by competent medical authority; it was unfortunately neglected until the day of grace was past. Remember also that epidemics of yellow fever within its zone are occasionally preceded by outbursts of other non-fatal forms of fever (Dengue for example). On any such occasion be on the outlook for its fatal successor, and be ready to move on its first appearance. Another point of immense importance is this: The history of nearly all the epidemics of yellow fever with which I am acquainted points to defective hygiene in the places that have suffered. It is notorious that in past days our barracks in the West Indies were generally placed in bad positions, and the conservancy arrangements were often very defective; there was no drainage, they were surrounded by offensive cesspools; so placed as to be acted upon by the sun, and to send their foetid emanations into the buildings occupied by the troops. Into these pits, as the late Dr. Bone and many other army medical officers have recorded, the evacuations even of men suffering from yellow fever were cast. In Bermuda, so late as 1864, things were not much better. Gibraltar, in its days of visitation, was in no better case; and Lisbon to this day has the reputation of being an uncleanly city. In an age of sanitation, it is not necessary to add more on this point. Naval officers are no doubt, by the regulations of their own service,

instructed that when yellow fever breaks out at sea flight to higher latitudes is essential for the safety of the crew. The sick should not be treated between decks, but under some temporary shelter on the upper deck; and the utmost pains should be taken to prevent the excretions of the sick from finding their way into any part of the frame of the ship; any wooden receptacles, such as buckets, that may have been used to receive such should be destroyed. There is evidence to show that yellow fever has on many occasions been brought both into men-of-war and merchant ships with coals saturated with the excreta of yellow fever patients. The protection of coal depots from the risk of such contamination is worth the attention of the naval and mercantile authorities within the yellow fever zone.

Treatment. — Although yellow fever is a specific disease, there is no specific treatment for it. Dr. Parkes has reminded us of the teaching of Lind on an important point of treatment. Here is the passage: "I have often observed the poor seamen," says Lind, "in the merchant service, to recover from yellow fever solely by having the benefit of a free and constant admission of the cool sea air into a ship anchored at a distance from the shore, where they lay utterly destitute of every assistance in sickness, and even of common necessaries, having nothing but cold water to drink, and not so much as a bed to lie upon; while gentlemen newly arrived from England, by being shut up in small, close, suffocating chambers at Kingston or Port Royal,

expired, with their whole mass of blood dissolved, flowing from every pore—the stifling heat of their room having produced a state of universal putrefaction in the body, even before death.” In the Bermuda epidemic, already referred to, the yellow fever patients were crowded into a building in the very centre of the “tainted district,” where “they lay on the floor ejecting black vomit over one another.” Surely Lind’s teaching was loudly called for there. The smallest allowance of cubic space should be 2000 feet per man.

The indications of treatment are: (1) to clear out the whole intestinal tract, without depressing the system; (2) to lower the temperature, to lessen headache, to calm restlessness, and to moderate the heart’s action and relieve dyspnoea; (3) to promote free action of the skin and kidneys; (4) to combat the typhoid state and to restrain hæmorrhage; (5) to moderate secondary fever, should it arise.

The bowels should be relieved by a full dose of calomel in combination with quinine, followed by castor oil. What answers the purpose equally well is a combination of calomel, extract of colocynth, and scammony; 5 grains of each, with a few drops of some aromatic oil. To attain the second indication, tincture of aconite in drop doses every ten minutes or quarter of an hour, until a full medicinal dose has been given; the effect being kept up, if need be, by repeating the same dose at intervals of longer duration, watching the effect; or from 2 to 4 drops of tincture of *veratrum viridis*, or 2 to 4 drops of *gelsemium* every two or four hours (Jones). When

the temperature, in spite of the above means, keeps as high as 105° or upwards, ice-cold water may be thrown into the bowels, and the vomiting should be restrained by giving the patient ice to suck, applying mustard to the epigastrium, or ice in a bladder or bag. Bellot has found drop doses of liquor arseniculis, up to 6 or 8 drops, at short intervals, effectual in controlling the vomiting. Great relief to the violent frontal headache is obtained by friction with a liniment of camphorated spirit and belladonna. There is no part of the treatment so essential as the promotion of free action of the skin and kidneys by hot mustard foot-baths, and the use of diluents, barley water, lemonade, iced water. Some years ago I met with a little work written by the master of a ship trading to the Havana, whose name has escaped me. All his life had been spent within the yellow fever zone. This old "salt" well knew the importance of stimulating the action of the skin; he invariably plunged his affected seamen into a tub of hot water and mustard "up to the waist," and he writes with enthusiasm of the good effects of this treatment. You will take this irregular bit of evidence as to this point *quantum valeat*, remembering, however, that some of the highest authorities recommend it quite as strongly. The greatest care should be taken to protect the patient from draughts of cold air on coming out of the bath. On the first signs of suppression of urine dry cupping over the loins should be used with hot stimulating applications, and cerebral excitement should be met with bromide of potassium.

When the state of febrile excitement has subsided and the patient passes into a typhoid state, iced champagne and beef-tea should be given. Blair preferred Rhenish wine to all others. Tympanites is often a distressing symptom; assafœtida enemata with turpentine are useful, not only by expelling flatus, but in stimulating the kidneys. The diet should at first consist only of the mildest articles. Barley water, water arrowroot, iced milk in soda water; and the return to more nutritious food should be gradual. Rest in the recumbent position is essential, not only during the active stage of the disease but until convalescence is well established. Over the hæmorrhages, so characteristic of the worst forms of yellow fever, medicine has little control. Jones advises scruple doses of sulpho-carbolate of soda to counteract the risk of septic poisoning which has been known to follow decomposition of the blood effused into the gastro-intestinal tract.

Quinine has no effect in controlling this fever, but it is useful in moderate doses in the secondary fever which sometimes occurs. Opium is condemned by all the best authorities in all stages of the disease. Treatment conducted on the conservative principles I have indicated is much more successful than when it was of a more "active" kind. Out of 256 cases treated much on the lines I have sketched for your guidance in this lecture, Dr. Joseph Jones, one of the best and latest authorities in the United States, had only 18 deaths.

LECTURE VIII

INSOLATION

THIS serious affection has many synonyms—sunstroke, sun fever, *coup de soleil*, calenture, heat-apoplexy, *detus solis*, *erythismus tropicus*. Insolation is the term by which it is designated in the official classification in use in the British army. The most inappropriate and misleading is that of heat-apoplexy. It is much to be desired that this term should disappear; it is based on false pathology, and has led to mischievous treatment.

Definition.—An affection of the nervous system induced by heat, solar or artificial, profoundly affecting the functions of circulation and respiration, with, in some of its forms, extreme pyrexia, unexampled congestion of the lungs, and a high mortality.

This formidable affection is one of great interest and importance to army medical officers everywhere, but more especially to those charged with the care of troops in hot climates. As I have elsewhere shown, it is a notable fact that in the statistics of the Indian army, before the date of the mutiny of the Bengal native regiments, this affection seldom appears; some forms

of it were included under the heading Ardent Continued Fever, while those proving quickly fatal with insensibility, convulsions, stertorous breathing, and such-like symptoms, were considered to be cases of cerebral apoplexy, and registered accordingly. Thus, in the example recorded by Martin, H.M. 13th Regiment, which marched from Nuddea to Berhampore in the midst of the hot weather, 63 men were struck down, of whom 18 died. All the cases were entered as "apoplexy." In my introductory lecture I referred to the case of the 68th Regiment, quartered in Fort St. George, Madras, in May 1834. The regiment paraded in full dress at an early hour in the afternoon for a funeral, and marched for several miles; one man died before the funeral was over, two more shortly afterwards, and men suffering from insolation in varying degrees were brought into hospital throughout the night, of whom many died. The 63d Regiment suffered in the same way at the same place, and under circumstances precisely similar.

I was an eye-witness to the terrible sufferings of the 98th Regiment on the occasion of the capture of Chin-kiang-foo, the last military operation of the war in China, under Sir Hugh, afterwards Lord Gough. The regiment arrived at the scene of operations only the day before, having come out from England in an overcrowded transport, under the command of an officer at that time without experience in tropical war. The men paraded for action in one of the hottest days of a hot season, dressed as if for a show parade in Hyde Park; they had, on landing, to take possession of a steep hill

of moderate height; before they reached the summit 15 men died on the spot from insolation, "they gave a few convulsive gasps, and died before anything could be done for their relief;" many others were struck down, and not a few perished during the night from the same cause acting in a less rapid way.

The 43d Regiment made during the Indian mutiny a march of 1100 miles from Bangalore to Central India; part of this long march having been made in the hot season, the men were exposed to a very high temperature by night as well as by day, and before it was completed they were in a state of extreme exhaustion. While in a valley at the foot of the Bisranguge Ghât, the thermometer in the largest tents stood at 118° and in the smallest 127° F. during the day, and at 105° at midnight. In this position cases of insolation were brought to the hospital tents at every hour of the day and night, and although a large proportion of them recovered, 2 officers and 11 men were buried under one tree in the neighbourhood of the camp (Barclay).

It is not on the line of march only that men suffer from insolation in hot climates; they are liable to it during the hot weather in India in barracks where the sanitary arrangements are bad; in other words, when overcrowding and imperfect ventilation are added to high temperature: of this I could give you many examples. Insolation may occur also on board ship under conditions similar to those in barracks. It is, for example, a common occurrence on board the mail steamers in the Red Sea, in the hot months of August

and September, the sufferers being generally affected when in the horizontal position in ill-ventilated cabins.

French men-of-war carry larger crews in proportion to the size of the ships than in the British navy. M. Bassier, surgeon in the French navy, reports in his *Dissertation sur la Calenture*, that in the month of August 1823 the man-of-war brig *Le Lynx*, cruising off Cadiz, had 18 cases of insolation out of a crew of 78 men. The heat was excessive (33° to 35° Cent.), and much aggravated by calms. In this case the ship was overcrowded; "*le bâtiment, très petit, offrait peu d'espace pour le coucher de l'équipage.*" Boudin (*Statistiques Médicales*) records that the French man-of-war *Dugesne*, while at Rio Janeiro, had 100 cases of insolation, out of a crew of 600 men. Most of the men were attacked, *not* when exposed to the direct rays of the sun, but at night, when in the recumbent position—that is, when breathing not only a hot and suffocating, but also an impure air.

Do not, however, suppose that this affection is confined to hot climates. The records of European warfare abound with examples of the effects of insolation on troops in the field. Let me give you a very striking one, the full details of which you will find recorded by Carlyle, in his rugged but graphic style, in the sixth volume of his *Life of Frederick the Great*. On the 6th of September 1760 that great commander made a forced march from Kloster Marienstern to the Spree, with the object of intercepting Marshal Dawn, the Austrian general. This was such a march for heat and

difficulty as the king never had before. 105 Prussian soldiers were struck down never to rise again. Marshal Dawn fared still worse in the heat of that terrible race; 200 of his men died on the road, and 310 more were invalidated for life.¹

Men will bear a high temperature in the open air with comparative impunity, provided (*a*) it is not too long continued; (*b*) that exertion be not pushed to the limit of human endurance, as in some of the marches given above; (*c*) that the free movement of the chest be not interfered with by dress and ill-contrived accoutrements; and (*d*) that strict temperance be observed. British sportsmen in India often pursue their exciting amusement in the hottest weather under the above conditions, and seldom suffer from sunstroke; they are of course careful to protect their heads and the upper part of their spines from the direct rays of the sun. It is needless to add that the conditions under which soldiers have to do their duty in war are very different, more particularly at a time when little attention was paid to suit the clothing and accoutrements to the nature of the climate.

The case of the 43d Regiment, as related by Dr. Barclay, and referred to above, brings out another pre-

¹ It is to be noted that, in accordance with the prevailing notions on the subject at the time, the hot, parched, and thirsty soldiers were forbidden to drink a drop of water. Carlyle describes how the poor men, as they crossed the water-brooks on the line of march, disregarding the cudgels of the sergeants, freely used, "pounced down irrepressible, and drank from the brim of the hat."

disposing cause which exercises a powerful influence, viz. the effects of prolonged exertion.

First, there is a great waste of tissue ; so long as the functions of the skin, bowels, and kidneys are maintained in tolerable activity, the blood remains pure ; but as the exertion continues under a high temperature, the function of the skin first diminishes and then ceases, the cooling effect of evaporation is lost, the temperature of the blood rises, and is loaded with effete matters, no longer excreted. Obstinate constipation, a constant condition, follows ; the activity of the kidneys is lessened, still further promoting blood impurity. In this state of the system the appetite fails, nausea succeeds, and the sight of food excites loathing.

From the above it is evident that while extreme heat is the real exciting cause, the restriction of the free movements of the chest by tight clothing and accoutrements, excessive fatigue with all its consequences, the impure air of ill-ventilated barracks and ships, are powerful predisposing causes of insolation.

A hot and moist condition of the air is most favourable to the production of insolation in crowded and ill-ventilated rooms, as it not only hinders the cooling effect of evaporation, but interferes also with the artificial means used to reduce the temperature of the overheated dormitories.

Morbid Anatomy.—The blood is invariably fluid, as in men killed by lightning, with extreme engorgement of the venous system.

The brain has been observed by Professor Arndt

to be moist ; in some dissections made by him seven hours after death, the ventricles were distended with fluid, the convolutions flattened, and sulci obliterated, yet the veins and sinuses of its membranes were without blood.

The nervous substance is always anæmic. I have never seen a single example of hæmorrhage into the substance or ventricles of the brain ; so far from this, the capillaries are empty, or nearly so.

The heart is, as a rule, from which I have *seen* no exceptions, contracted, and the colour a dull red, the tissue dry and fragile ; the general muscular system presenting the same appearance.

The lungs are in a state of hyperæmia without example in any other disease.

The liver is usually enlarged, has a doughy feeling, and when impressed by the finger the marks remain ; the acini are distinct, and its substance dry.

The kidneys are enlarged, the capsule easily separable, the cortical substance pale, the medullary injected with blood, the tissue charged with albuminous and fatty molecules. Arndt found the blood loaded with excreted material, an observation confirmatory of the effects of high temperature and fatigue hindering its depuration, pointed out in the course of this lecture. Arndt's dissections were made on the bodies of soldiers who died suddenly, as in some of the examples I have given you. The blood is rich in carbonate of ammonia, and extremely dark in colour ; there is thus a strong analogy between the blood of men dying from

the effects of high temperature and in cases of septic disease.

Insolation is seen in three forms, which the late Dr. Morehead described as the cardiac, the cerebro-spinal, and the mixed—terms which are sufficiently convenient. The cardiac or syncopal variety is the one usually seen to occur at night when men are in the recumbent position under the conditions I have described; and also when making excessive exertion in a hot sun, as in the case of the 98th Regiment, death taking place from failure of the heart's action suddenly, before the sufferer has time to give warning of his distressed condition, and often before anything can be done for his relief. If death does not take place at once the patient will be found in a state of extreme prostration, the skin pale and moist, with a weak and fluttering pulse.

In the so-called cerebro-spinal variety there are premonitory symptoms. Heat of skin, which is ardent and stinging, with extreme dryness; giddiness, congestion of the eyes, debility, nausea, and frequent micturition. This last symptom was first noted by my colleague Professor Longmore, and also by Dr. Barclay, the constant cry of whose men was, "I cannot hold my water." Headache is extremely rare; sometimes a wild shout of terror followed by an attempt to escape from an imaginary enemy gives the first warning to bystanders of what is impending. When men in barracks are sensible of the above premonitory symptoms, or some of them, they assume the recumbent position, and in that state pass into coma, the attention of their comrades being first

called to their condition by their stertorous breathing. The respiration is hurried, the pupils contract and are insensible to light, the conjunctivæ become of a pink colour, the heart's action is irregular, with a quick, irregular, and fast failing pulse. Convulsions, always of an epileptiform character, may or may not be present; patients sometimes dying without moving a limb. The temperature reaches 107° , 108° , and sometimes 110° F., within three degrees of the temperature at which the myosin of the blood coagulates. It sometimes happens that the cerebro-spinal nerve centres are so profoundly affected by the high temperature in weakly subjects, that asphyxia and apnœa come on before there is time for the development of the above symptoms, in such cases death takes place with great rapidity.

In the so-called mixed form the symptoms, as we might expect, present some of those of both varieties. It is not necessary to overload the description by attempting to define them. Morehead was of opinion that the cerebro-spinal variety of insolation was the one most frequently seen in the sthenic constitution of the newly-arrived European; yet it is certain that in the case of the men of the 43d Regiment, worn out by excessive fatigue in their long march, this was the form of the affection which most prevailed amongst them; while the men of the 98th Regiment, fresh from Europe, suffered from the cardiac variety.

Sequels.—The most common is epilepsy in various degrees of severity, from slight epileptiform convulsions to the severest forms of the disease. I have seen an

immense number of soldiers invalided from India for this affection following sunstroke ; in a large proportion of the cases the attacks had disappeared before arrival at Netley, particularly in the long voyage round the Cape of Good Hope ; in others, as a rule, we found the disease amenable to treatment ; so that the prognosis is on the whole favourable. A much more formidable sequel is persistent headache depending probably on chronic meningitis, with some thickening of the membranes. This is often a cause of much suffering, sometimes extending over years. Not unfrequently there is more deep-seated cerebral mischief, giving rise to mental weakness and a long train of distressing symptoms, often of a hopeless kind. I have seen a few examples of chorea-like movements of the muscles of the forearm and hands, probably due to nerve irritation, kept up by the impure condition of the blood already described.

Diagnosis.—The diseases with which in former years sunstroke was most often confounded appear to have been cerebral apoplexy and ardent fever ; with the former it has no pathological relations. In both apoplexy and insolation we have coma ; the pulse in the former is slow, generally full, often intermitting. In sunstroke it is usually quick and sharp. In apoplexy the breathing is slow, irregular, and explosive in expiration. In sunstroke it is rapid and noisy, but not explosive. In apoplexy the pupils are, as a rule, dilated, or one is more so than the other. In sunstroke in every case seen by me they were contracted ; the skin in apoplexy is not hot, is indeed often cold and moist ; in

sunstroke, except in the cardiac variety, it is very hot and excessively dry.

Hemiplegia is the almost invariable result of cerebral hæmorrhage; I never saw it follow directly on sunstroke.

Prognosis.—The most unfavourable signs are prolonged and complete insensibility, without movement, a much more alarming condition than occasional convulsions, intense heat of skin resisting the use of the douche and other means of applying cold, increasing congestion of the eyes, tumultuous action of the heart, failing pulse, and lividity of hands and feet.

The mortality from sunstroke has always been high, as high as 45 or 50 per cent; it is now, under a more rational treatment, much diminished; but it must be kept in mind in estimating the death-rate that in our military statistics it is only the direct mortality that is recorded. Many men are invalided for the sequels of the disease, some of whom, after lingering for a longer or shorter time in civil life after discharge, ultimately die from chronic cerebral diseases induced by it.¹

¹ During 1868 no less than 241 admissions for insolation occurred in the Bengal army. All but 14 were admitted in the months of June, July, August, and September. The maximum in one month (114) occurred in August. With a minimum of 2.41 per 1000 in Bengal proper, they rose to a maximum of 11 in the Punjab. In this last province 144 cases were treated, occurring mostly among troops marching to the frontier campaign in August. Of these all but 13 were successfully treated. The ages of those who died present a remarkable contrast to those who died of typhoid fever. Of the 92 deaths from sunstroke returned in the age statement only 16 were under 25 years of age. The ratio of mortality was nearly double among the older men. The mortality

Prophylaxis.—The immense improvement that has taken place in barrack accommodation in India has done much to lessen the number of cases of barrack insolation, and the danger of overcrowding is well understood. It is a good rule even now, when the night temperature is exceptionally high, to have tents pitched, so as to diminish the number of men in the barrack dormitories.

In future troops are not likely to be drilled in a hot sun or made to attend funeral parades at 3 P.M., or marched in hot weather, except under a pressing military necessity. When such a cruel necessity exists, an abundant supply of water for drinking and douching purposes should be provided, the pace should be easy, the halts frequent, and as much as possible open order should be observed; a point much insisted on by Marshal Ney; alcoholic drinks should be forbidden, tea and coffee being, where practicable, substituted. During the military operations of the last war in China, an officer in command of a battery of artillery, when the troops were called out for duty on a hot day, willing to do his men a "kindness," opened the canteen, and allowed every man a spirit ration. That battery had more cases of sunstroke on that day than all the rest of the force engaged.

As is well known, since the days of the Indian Mutiny the dress of the British army in India has undergone an immense improvement, and instead of the

of the cases treated, all round, was 35.68 per 1000 (*Vide* Report of the Sanitary Commissioner with the Government of India for 1868).

head-dresses in use before that time, the head, neck, and spine are now better protected by means adapted to the purpose.

Treatment.—It is hardly necessary to dwell long on the fact now well established, that bleeding is not only not required, but is in this affection, in all its forms, a fatal proceeding. In the article Sunstroke, communicated by me to Russell Reynolds' *System of Medicine*, I have given examples of the bad effects of this measure. These examples are written for your learning. I have reason to know that their publication contributed to the extinction of the practice.

In the slighter forms of mere exhaustion from heat, without the formidable symptoms of developed insolation, mere removal into the shade, rest in the recumbent position, opening up of the clothes, a mild and not too long prolonged douche over head, nape, and chest, stimulation by means of ammonia to the nostrils will suffice, a watchful eye being kept on men in this condition lest more formidable symptoms should supervene.

In real sunstroke, when a man falls, more energetic means are required. The patient should be removed into the shade and stripped, and the douche should be used with energy to head, nape, and chest, and repeated again and again, until the function of respiration is restored. A large mustard-plaster should be applied to the chest, and he should be still further roused by flicking with a wet towel, or flagellation with an extemporised "rod"; a turpentine enema should be given, and he should be encouraged to drink freely of cold water.

In those cases where the temperature is high the above means will require to be repeated from time to time; he should be enveloped in a wet sheet, and an enema of ice-cold water should be given—one of the most powerful means at our disposal. Even after the temperature has been reduced there is always a tendency to a dangerous recurrence of it; on the first thermometric indications of this the above means must be used persistently until this thermic condition is removed. On the first appearance of convulsions the *cautious* inhalation of chloroform will often calm them, and continued insensibility must be met by a blister to the nape or to the shaven scalp, which is often most effective; the bowels should be freely evacuated.

On the appearance of any of the sequels I have described removal to a cold climate at the earliest possible period is essential. This often effectually cures the epileptiform convulsions. Bromide of potassium, the use of a mild shower-bath, sea-bathing, and attention to the general health will generally effect a cure in the more obstinate cases.

The persistent headache is best dealt with by iodide of potassium. I have tried counter-irritation in various ways without much effect. The daily use of an ice-cup for an hour or two is often a great relief. On the other hand it sometimes aggravates suffering. In men of a robust constitution a carefully regulated course of mercury is sometimes effectual, promoting, we may reasonably suppose, the absorption of effused lymph.

In all cases of sunstroke return to a hot climate

should not be thought of until every trace of the effects of the attack have disappeared for at least a year. In some of the more severe cases return is not admissible at all. Every case must be judged on its merits, and not settled by applying one rule to all.

To the above measures I would add a well regulated course of massage as highly conducive to recovery.

LECTURE IX

DIARRHŒA

“BOWEL complaints” have always been conspicuous in the statistics of tropical diseases. Sir Ranald Martin, in a memorandum prepared for the Royal Commission that inquired into the health of the army of India, showed that next to malarious fevers bowel complaints are the most prevalent; while the dangers to health and to life from these last are even greater than from fevers. In the Presidency of Madras, out of an aggregate British force of 82,342 men serving there from 1842 to 1848, there occurred 10,531 cases of dysentery, and 9189 cases of diarrhœa, making a total of 19,720 cases of bowel complaints, exclusive of cholera.

My long experience at Netley enables me to say with confidence that probably more than a half of the cases in the above statement entered as diarrhœa were in reality cases of chronic dysentery.

A definition of diarrhœa is hardly necessary. By this term is understood a flux from the small intestine, the result of local or constitutional causes, the stools passed without tenesmus, and presenting much variety

in consistence, colour, and odour. The more serous the evacuations are, and the more rapidly the blood is deprived of its watery constituents, the greater is the effect on the system and the danger to life.

Diarrhœa may be regarded from two points of view : as a disease in itself, or as a symptom and complication of many diseases. It is the first that concerns us here.

Many causes contribute to set up this affection ; such as sudden alternations of temperature from heat to cold, affecting the function of the skin, determining hepatic congestion, with functional derangement of the liver ; errors in diet, particularly on first arrival in a hot climate, the use of food, more especially fish or shell-fish, in the stage of decomposition ; impure water, breathing a privy atmosphere ; mental emotion, acting on the mucous membrane or muscular coat of the intestine, by impressions conveyed through the nervous system. This cause is well illustrated in military life by the number of men seen to "go to the rear" under the influence of emotions excited by the near prospect of battle, which quickly pass away under the fierce excitement of combat.

Observation has convinced me that the worst idiosyncrasy a person can take with him to a hot climate is the disposition to relaxation of the bowels from slight causes. Such people are not only liable to frequent attacks of diarrhœa, but are among the first to suffer from dysentery and cholera when exposed to the contagium of those affections.

Diarrhœa is often the means by which injurious matters, solid or gaseous, that have been taken into

the system are quickly thrown out. Two friends of mine, driving in an open carriage, pulled up for a few minutes near a livery stable in a country town; close to the carriage was a grating for ventilating the main sewer; a quantity of boiling water was poured into the sewer from the neighbouring stable; in a moment the carriage and its inmates were enveloped in a cloud of watery vapour, carrying with it a putrid and intolerable stench. To this my friends were exposed only for a few seconds, as the coachman instantly drove quickly away. All three were soon attacked by nausea, had to hasten home, and were smartly purged, the evacuations having the same offensive odour as the sewer air that so quickly affected them.

When the Wellington Barracks, near Conoor, on the Neilgherry Hills in the south of India, were first occupied by a battalion of the Rifle Brigade, diarrhœa prevailed to a great extent among the men, which was at first, as usual, set down to "climatic causes." The real cause was a privy atmosphere. During the construction of the buildings the native workmen were under no police conservancy, with the natural result, the ground was left in a condition of extreme filth; when this was remedied the diarrhœa disappeared.

In the lecture on Enteric Fever I have given evidence in abundance of the evil consequences of establishing a privy atmosphere in and about buildings where many men are congregated.

Among the causes of diarrhœa I have mentioned shell-fish. At certain seasons rock-oysters are supplied

in the market at Madras. Out of every hundred an uncertain number of them are distinctly poisonous, whether from decomposition or some other cause I cannot tell. I have been called twice in one night to see new arrivals from "up country" in one or other of the hotels, suffering from diarrhoea of an alarming kind after partaking of rock-oysters, esteemed a great delicacy by those who have been long quartered away from the sea-coast. The symptoms were nausea, vomiting, profuse watery purging, extreme weakness, a cold and clammy skin, with a weak and fluttering pulse; in a word, a condition hardly to be distinguished from the collapse of cholera. To one case that proved fatal I was called in consultation. The patient, who by the way was a noted *gourmet*, had made a long journey to the coast during the oyster season, to "enjoy his favourite dish." This gentleman, who was known to his medical attendant to be prone to diarrhoea, was warned in vain to abstain from his "favourite dish," died with the symptoms I have just described. Ashamed of his weakness he did not send for his doctor until it was too late to save him.

Among the predisposing causes of tropical diarrhoea must be placed malaria. A malaria-struck man is extremely sensitive to alternations of temperature; his heat-generating powers are impaired, and he suffers from chills brought on by sudden variations of which healthy men take no notice. We see this in the persons of invalids brought home from India at improper seasons. Unless they are carefully protected by suitable warm clothing, when they are exposed to the damp cold of our

high latitudes, they are almost certain to suffer from diarrhœa, more particularly if they have had the disease in India.

Young persons on first arrival in a hot climate are liable to have an attack of so-called bilious diarrhœa ; under the stimulus of unwonted heat the biliary secretion is increased to such an extent as to provoke it, or what is perhaps a more common cause, over-indulgence in highly-spiced food sets up relaxation, and the irritation of the mucous membrane by reflex action promotes a profuse biliary discharge which aggravates the diarrhœa.

In the introductory lecture I adverted to the great mortality among the children of European soldiers from the diarrhœa of dentition, aggravated by unsuitable food.

On the hill stations on the spurs of the Himalaya Mountains there prevails at certain seasons, usually the setting in of the rains, a "white flux," which, more than twenty years ago, was first carefully described by my friend Dr. Alexander Grant of the Bengal army, in the *Indian Annals*. The sanitation of Indian hill stations, when first occupied, was too often left to chance. But hill stations, any more than other places of equal salubrity, do not prosper under such a system ; soon the seeds of disease, carelessly planted, grow to maturity, and produce their invariable fruit. So it was in the early days of our hill stations. Enormous quantities of night soil were allowed to be cast down the slopes of the hills leading to the ravines below ; the rains in due time dissolve such accumulations, and two things result : the sources

of water supply are polluted, and the air carried up from the hot steaming ravines and valleys is charged with foul matters. No doubt, also, the change from the hot plains to the cool atmosphere of these elevated regions, more particularly the damp and cold nights, provokes there, as elsewhere, the hepatic congestion and functional derangement of which Dr. Grant writes; more particularly when acting on the systems of men and women charged more or less with malaria from residence in malarial climates on the plains below.

Dr. Grant describes the stools as pale drab or muddy gray in colour; frothy and feculent in the early stages, later on becoming gray and pultaceous, or lienteric; giving off an odour described as "peculiar and unnatural," but not offensive. They are often quite white. This affection, if not successfully dealt with at first, is apt to become chronic, reducing the patient to an anæmic and exhausted condition, and at this stage is a danger to life. Although originating on the hills it is apt on return to the plains to break out again, necessitating removal to Europe. Both Dr. Grant and Dr. Goodeve refer to this, the latter instancing the case of H.M. 29th Regiment, the 2d Bengal Europeans, and the Bengal Artillery, who suffered in the plains after having, previous to joining the army of the Punjab in 1848-49, being subject to the disease on the hills.

White flux is not confined to the hill stations of India; a very obstinate form of diarrhœa in which, after a time, the stools present the pale drab or whitish colour described above, is seen on the malarial plains, and

when neglected and allowed to become chronic it is a tedious and dangerous affection, reducing the sufferers to an emaciated and anæmic condition under which they ultimately succumb. The disease begins in an insidious way, at first exciting little attention and no alarm. The motions may not exceed two or three in twenty-four hours; are not in the first instance either pale coloured or fluid, only assuming their characteristic appearance at a later stage. If not checked by appropriate treatment, symptoms of grave constitutional derangement appear; the patient becomes dyspeptic, suffers from flatulent colic; the tongue becomes red, smooth, and glazed; the mouth is covered with aphthous sores, which extend to the edges of the tongue; the appetite fails, nutrition becomes daily more imperfect, and the stools, having now assumed their characteristic appearance, become more frequent and copious, and are voided with violence, an invariable symptom of the scorbutic condition, which is now fully established. This white flux should, in my opinion, be designated Scorbutic Diarrhœa. I have at this time under my care a gentleman of our own profession, from Ceylon; after suffering much in that island from malarial fever, some attacks of dysentery, and rather acute hepatic derangement, he returned to his native country. After attempting the practice of his profession in a cold and exposed district, he fell into a condition closely resembling that described above. Kept for a long time before he came under my care without vegetable food in any shape, the scorbutic condition, more or less present from first in Ceylon, became fully

developed; he had daily from three to four large, pale, yeasty-looking, very offensive motions, passed with force, and sometimes nearly filling the pan of the close stool; he suffered severely from flatulent colic; his gums were red, soft, and spongy, and from them thin watery blood flowed almost incessantly, particularly at night, his pillow in the morning having invariably a large bloody stain, and his teeth covered with loose clots. On his legs were several scorbutic patches. The treatment in the first instance was entirely directed to the cure of the scurvy, all attempts to control the diarrhoea by means of astringents were given up, his diet was regulated so as to give his blood what it so much needed, an abundant supply of vegetable elements. In a surprisingly short time a great improvement took place in this gentleman's condition; his gums ceased to bleed and became firm, the scorbutic patches disappeared from his legs, the stools were reduced to one or two in twenty-four hours, diminished in quantity, and improved in colour and consistence, and were no longer voided with force. His appetite improved, he was not troubled with the daily attacks of flatulent colic which had caused so much suffering; he gained flesh visibly, and he is now able to take long drives and to spend much of his time in the open air. I must not omit to mention that when I first examined his urine it presented much to alarm, and to give an additional aspect of gravity to the case; it was of low specific gravity, contained a large quantity of pus, albumen, mucous, and blood. He has now been a month and a few days

under treatment, and only a very small quantity of albumen remains, which is day by day diminishing. The patient had also a tight stricture in the membranous part of the urethra; when he first came under treatment in the scorbutic condition described, it was impossible to attempt dilatation, for the moment the softest catheter was introduced into the orifice of the urethra, blood flowed out to such an extent that it was impossible to proceed. As soon as the scorbutic symptoms disappeared this complication was dealt with at my request by my friend Dr. Bullar, without much difficulty.

I have given you the details of this case at length, because it illustrates a point I wish much to insist on, viz. the part that scurvy plays in either causing or complicating the bowel complaints of India. When a batch of invalids are brought into this hospital, the first thing done is to see to what extent they are scorbutic. Long experience has taught me that all treatment for the relief of diarrhoea or dysentery will fail unless this complication is removed.

I frankly tell you I never thoroughly appreciated the importance of scurvy in tropical medicine until I came to Netley; it is not in bowel diseases only that it acts as a grave complication, but in many other diseases, as has been much insisted on by my friend Sir Anthony Home, V.C. This able and experienced medical officer has even found a not inconsiderable number of men in the ranks of regiments, inspected by him, giving evidence of the presence of this cachexy. I commend this point to your serious attention and future watchfulness.

All trustworthy authorities on tropical medicine have called attention to hepatic derangements in the diarrhoea of hot climates, both as a cause and a complication. I have elsewhere pointed out that persistent diarrhoea is often in India a significant symptom of hepatic abscess, and is one of the most powerful factors in lowering the system in that dangerous disease.

The *Morbid Anatomy* of diarrhoea will of course depend on the cause that has excited it, the duration of the disease and its complications. As I have before remarked, many, I should say more than a half, of the cases sent from India to Netley as "chronic diarrhoea," are, in reality, cases of chronic dysentery. When such terminate fatally the lesions are almost entirely confined to the large intestine, unless there has been a scorbutic complication, when they will be found to extend beyond the cæcum into the ileum. But, as my colleague, Professor Aitken, has shown, it is a mistake to suppose that the lesions in fatal cases of diarrhoea are confined entirely to the small intestine. "There seems," he says, "to be conclusive evidence to show that much of the intestinal catarrh described by the common name of diarrhoea is associated with an *erythematous* congestion of the mucous surface of the intestine, extending in patches of a few inches to several feet in extent in all parts of the canal, and rarely attended by increased vascularity of the submucous tissue. They are more common in the ileum than the jejunum, and still more frequent in the colon." Goodeve, who has examined the intestines in some fatal cases of white flux, was surprised to find, in

spite of the long duration of the disease, few changes of importance in the mucous surface; but he noticed an appearance with which at Netley we are very familiar, viz. thinning of all the coats of the intestine, until they are quite diaphanous. Enlargement of the solitary follicles of the bowel to the size of pin-heads, surrounded by a little ring of vascularity, tumefaction, and hypertrophy of villi, and pigmentary deposits in Peyer's patches (Aitken) are the most common lesions. In some cases of white flux observed by me in India and at Netley, I have been able during life to make out atrophy of the liver, and *post-mortem* have found the organ to be so closely embraced by an adhering capsule as obviously to interfere with the circulation of the gland. In some this was to all appearance the result of perihepatitis. At this time I have under my observation a tropical patient suffering from chronic diarrhœa of long standing, in whom atrophy of the liver is only too evident, under percussion; in this case the patient gives a history of an attack of acute pain in the liver resembling that of pleurisy, which, in all probability, was due to inflammation of the capsule.

Diagnosis.—The only disease with which diarrhœa can well be confounded is dysentery, when that affection has passed into a chronic stage, and when the stools have become copious, fluid, and of a brownish colour. Here the past history of the case, if carefully inquired into, ought to guide to a correct diagnosis; the odour of the dysenteric motions so peculiar, characteristic, persistent, and offensive, remains sufficiently distinct

to the last to be at once recognised by an experienced physician.

In diarrhœa, pure and simple, there is often severe griping, but there is no tenesmus.

Treatment.—To treat tropical diarrhœa with success, it is above all things necessary that treatment should be early, that is, before the disease gets into a hopelessly chronic stage. Careful medical officers in India invoke, for this purpose, the aid of regimental officers in command, to ensure that men seen, in barrack language, “to be going often to the rear,” are duly reported.

The next point is that treatment should be based on a careful consideration of the cause that has excited the disease; in other words, that it should not be carried out as a matter of routine, astringents being resorted to merely to counteract the looseness of the bowels, without reference to the nature and cause of the looseness.

In that form of diarrhœa, due to over-indulgence in too stimulating food, so common in the case of fresh arrivals, with nausea, foul tongue, griping, and copious feculent stools, an antacid draught composed of a moderate dose of rhubarb in combination with the compound chalk powder in a little aromatic water, rest in the recumbent position, and a hot fomentation to the abdomen, will give immediate relief. If the griping continues, a few drops of the “mixture against diarrhœa,” to be found in the *Field Companion*, with a few drops of tincture of opium, will soon allay the irritation. A restricted diet will be necessary for some days, and much benefit will be derived from a few grains of

rhubarb with powder of calumba, four of each, with 12 grains of bicarbonate of potassium in some aromatic water. The formula for the aromatic mixture will be found in the Appendix. It is often most useful in allaying the griping to which young and unseasoned soldiers are liable when marching in the early morning, and which often alarms them with a groundless fear of cholera. If cholera prevails, diarrhœa is certain to prevail also, as will be shown in the lecture devoted to that disease. Prompt suppression of this diarrhœa is a point of preventive practice of the first importance. The aromatic mixture to the extent of 10 or 20 drops, with 15 or 20 of the tincture of opium, should be given at once, the patient being confined to the recumbent position; the aromatic mixture in 5 drop doses being repeated from time to time as occasion demands. If the patient shows a tendency to faintness, warm brandy and water should be given at once.

Dr. Goodeve gives a therapeutic caution on the use of chalk mixtures in hot weather in India, which I commend to your attention. "Chalk and other mixtures should never be made up with sugar and mucilage in the hot and rainy seasons, or they should be made up for the day only. In less than twenty-four hours the mixture runs into fermentation, and is hurtful in diarrhœa;" and he adds, "the chalk mixture of the London Pharmacopœia is always useless in India." Mixtures containing chalk should be sweetened only when taken.

In the form of diarrhœa which follows the sudden application of cold to the surface, in which the stools are serous, with shreddy feculent matter suspended in them, presenting various shades of colour from dark or greenish-brown to gray or white, there is generally some vascular excitement preceded by rigors, more or less severe. In such cases the stools soon lose their feculent nature, and unless treatment be early and judicious, the "white flux" is apt to be established, which, as already shown, is a form of diarrhœa extremely difficult to cure.

Obviously here the first indication is to restore the suspended function of the skin and liver. For this purpose a hot bath taken at the bedside, and followed by placing the patient between blankets, instead of sheets, is a measure often followed by the best results, provided care be taken not to expose the hot surface to cold air. The action of the skin may be still further promoted by Doner's powder, 8 to 10 grains, with the addition of 1 grain of ipecacuanha, and the application of a sinapism over the region of the liver. If the motions continue to show want of bile, it will be advisable to give a few small doses of blue pill, or of gray powder with soda. If the stools continue after the above treatment to be copious and serous or watery, Dr. Harkin's method of blistering the skin over the course of the vagus may be tried; it has sometimes been followed both in acute and chronic diarrhœa with surprising effects.

In the hill diarrhœa, so often the outcome of damp-cold, the same attention should be paid *from the first*

to restore the action of the skin, and by the same means diligently persevered in, every effort being made to prevent this troublesome affection establishing itself in a chronic form, which it is almost certain to do unless successfully dealt with in the early stages. The use of astringents in the early stage of this form of diarrhœa seems only to aggravate and confirm it. In addition to the above means the nitro-muriatic acid bath of Scott and Martin should be used ; or a compress soaked in this acid, of the strength used in the bath, may be applied over the belly. It is often most successful in promoting free biliary secretion. The formula for this bath will be found in the Appendix. I strongly advise the use of what is called the hydropathic belt in this and many other forms of chronic diarrhœa ; it acts in two ways ; by the firm support it gives it seems to diminish the chronic congestion of the abdominal organs, and to act as a perpetual fomentation of the most soothing kind. It is easily extemporised. A piece of stout calico is shaped so as to fit closely to the abdomen, with long ends to fasten behind ; a double or treble fold of calico wrung out of the acidulated or even simple cold water, is retained *in situ* next the skin by means of a few tapes stitched on at right angles to the length of the belt, and over the wet calico (that is behind it) a piece of waterproof material ; this can be worn day and night as long as it is required, being only removed for an hour or two during digestion. Salicin, to the extent of 5 or 6 grains, with 1 of ipecacuanha three or four times a day, is an excellent

remedy. Attention to the general health is of course important; above all, the diet should be so regulated as not to superadd a scorbutic element to the disease, which is too often done by confining the diet exclusively to farinaceous articles. Where Bael fruit is useful, I am sure it is in counteracting this tendency to scurvy. The pernitrate of iron with glycerine is the best remedy against the anæmia of diarrhœa. When patients are sent from India to their native land for chronic diarrhœa, attention should be paid to provide warm clothing, and to the season of arrival. The diarrhœa of infancy in India requires careful treatment, more particularly during dentition. The stools then often present an appearance nearly resembling chopped spinach, the colour being often of a more vivid green, due, almost always, not as is commonly supposed, to depraved biliary secretion, but to an excess of free acid in the stomach and bowels. No treatment is more pernicious in such cases than the administration of mercurials, with a view to correct this faulty action of the liver; they invariably aggravate what they are intended to correct. In such cases small doses, a grain or two according to age, with twice or three times as much bicarbonate of soda, often acts like a charm, and is always useful. In plethoric children, whose gums are hot, tense, and swollen over the advancing tooth, the gum-lancet is required, and often not only helps to check diarrhœa but wards off convulsions, or with the aid of a few whiffs of chloroform, as recommended by Sir James Simpson, relieves them when present. In

anæmic children, whose blood is thin and watery, the gum-lancet is not a safe remedy ; the difficulty of suppressing hæmorrhage from the scarified gum being always great, sometimes impossible. Children in this condition are often saved by a change of diet ; the juice of a half-raw beef-steak, extracted by a lime-squeezer, has in my hands rescued many children of tender age from extreme peril. It is an old and well-known remedy, or rather means of sustaining life, and if to it is added, when the lamp burns low, a few drops of brandy, it will be all the better. I frankly tell you that I have sometimes had to regret my timidity in the use of support of this kind in tiding young children in India over critical hours, not in bowel complaints only, but in other diseases also, but have never once had to reproach myself with too great freedom in the use of such means.

LECTURE X

DYSENTERY

THE Royal Commissioners, in their famous Report on the Health of the Army of India, remark under the head of Dysentery, next to fevers in frequency, but more fatal, comes the dysentery of India. In its causes it is intimately associated with tropical fevers, remittent and intermittent, so much so that where fevers are present dysentery is never far off. Out of an aggregate British force of 25,433 men of her Majesty's army, serving in periods of eight and ten years respectively in the stations of Calcutta, Chinsurah, and Berhampore, all in Bengal Proper, there occurred 8499 cases of dysentery and diarrhœa, an amount of sickness under this one head they truly characterise as "enormous." On the authority of Sir Ranald Martin, the Commissioners go on to say that amongst British soldiers eleven cases of dysentery occur to one amongst the native soldiery. In acute dysentery there is much present danger and suffering, and when the disease is not arrested at once, chronic suffering, extending over years, or the prospect of death more or less distant in the hospitals, is all that remains

to the soldier. The case is described by the older army surgeons as presenting "a spectacle of distress of as pitiable a kind as can be found in the history of human suffering." Invaliding and death are the last events, and most of the deaths which occur amongst sick soldiers on the voyage homewards from India are from chronic dysentery.

This is a gloomy picture. I place it before your eyes at the outset of our study of this disease, for the express purpose of awakening your minds to the importance of the subject on which we enter to-day. I am thankful to say that while it must be admitted the colours are not too dark and the picture only too true to nature, it depicts a scene of the past, of that pre-sanitary age of which I have had so much to say in the course of my lessons in this school on other branches of military medicine, as well as that devoted to the diseases of hot climates. It is not in India only that dysentery has been one of the chief causes of mortality and invaliding; it has prevailed in all climates, and has been the scourge of armies in all ages.

I regard the enormous diminution that has taken place in the death-rate and invaliding from this disease as the most notable example of the triumph of improved sanitation and successful treatment of which modern tropical medicine can boast, and it always gives me great satisfaction, year after year, to associate the name of Dr. Docker, formerly of the 2d Battalion of the 7th Royal Fusiliers, with a method of treating this disease, which, although not original, for it is a revival of an old

method, has done more to lessen human suffering wherever this disease prevails than any other plan of treatment our art has been able to suggest; and I rejoice that at last the State has, although late in the day, acknowledged this great service to suffering humanity. As I have elsewhere shown, in the year 1883, out of a force of 13,000 men 500 cases of dysentery were treated with only two deaths. In the pre-sanitary age I have known one regiment, with an average strength of 1098 men, have 2497 admissions and 104 deaths in one year; the deaths mostly from two diseases: dysentery and its common sequel, tropical abscess of the liver.

It is tropical dysentery with which we have to do here; a reference to any of the text-books in your hands will give you particulars of the universal prevalence of this disease in various forms, more particularly that great storehouse of medical literature, the *magnum opus* of my colleague Professor Aitken.

Pathology.—I have always believed and always taught that the dysentery of India is a specific disease—that is, that there is something specific in the poison that causes it, although there are many ways in which this poison can be, so to speak, brought into active operation. In the quotation from the Report of the Royal Commission with which I opened this lecture, the intimate relation between tropical dysentery and malarial fevers is brought out; not only must we regard malaria as predisposing to dysentery by its action in undermining the general health, but it seems impossible to resist

the evidence that it is in itself a direct cause. Nothing is more certain than this, when malarial fevers were endemic in England over large parts of the kingdom, dysentery was also a prevailing disease. The cultivating hand of man, except in a few corners where the old conditions in a small degree are unchanged, has banished malaria from the soil, and with this poison malarial fevers and dysentery have disappeared. There is no more familiar fact than this: a party of men go into unhealthy jungles at a dangerous season, some will return with a remittent or an intermittent fever, others with an attack of dysentery. Not many years ago a young coffee planter was placed under my care in the neighbouring town of Southampton; he was one of five men about his own age, and of his own calling, who committed this act of folly: two contracted severe remittent fever, of which one died; two others, of whom my patient was one, were punished with dysentery, in his case with the formidable sequel of a pyæmic abscess of the liver; the fifth escaping uninjured. Naval officers employed on the coast of Africa relate similar examples in the case of boats' crews, going inshore at night, watching the mouths of malarious rivers for slave-ships seeking to evade the blockading men-of-war. Dysentery in hot climates can often be traced to exposure to relatively cold air, particularly when blowing from malarial quarters. In the article Dysentery, in Russell Reynold's *System of Medicine*, I have given the case related by the late Dr. Mackay, R.N., of seamen in ships serving in the malarious rivers of China sleep-

ing on deck, rolling up their jerseys on account of the heat in the early part of the night, thus exposing their naked bodies to the cold morning air, blowing from the rice-swamps, with, in many cases, dysentery as the consequence. We have seen that water charged with decomposing vegetable matter can carry malarial poison into the system and develop fever; there is abundant evidence that dysentery can be caused in the same way, more particularly when fæcal impurities are added, as in the tanks in the native quarters of Calcutta, so often referred to by the sanitary officers of that city as sources both of dysentery and cholera.

Dr. Chevers has pointed out that much of the cholera and dysentery that prevailed in Calcutta in his time on board the vessels frequenting the Hooghly was caused by drinking the always muddy and filthy, and often brackish water, taken up in buckets over the ship's side. Nearly every person in his time, native or European, who came to Calcutta, suffered more or less from some kind of bowel complaint, but none so much as seafaring men. Opposite to Calcutta, where the shipping anchor, 40 tons of excreta were in those days discharged into the river daily. Things are a good deal changed now. Much, if not the whole, of this enormous amount of impurity is, under the new system of drainage, carried and discharged elsewhere. And the better quarters of this great city are now supplied with comparatively pure water: two measures which have exercised a vast influence in diminishing sickness and mortality from bowel complaints and cholera.

As if to prove the accuracy of Dr. Chevers' account, the municipal authorities supplied hydrants along the river-bank, for supplying the shipping with purer water from the new source of supply ; immediately a marked diminution in the amount of sickness among the ships' crews took place. The new supply falling short, the river-bank hydrants were cut off, the shipping had to fall back on the old source of supply alongside ; at once the sanitary officer had to record a large increase in sickness among the class affected by this unintentional experiment.

Very memorable to me is my first introduction to what, without hyperbole, I may call the home and headquarters of dysentery, viz. the barracks of infamous notoriety known as the old infantry barracks of Secunderabad in the Deccan. They stood on low ground, swampy on one side, overshadowed by rocks on the other ; exposed to the malarious influence of the marsh during the south-west monsoon, the rocks on the other side cutting off the invigorating wind from the opposite quarter. A crowded graveyard close to the buildings on a higher level, drained in the direction of what for many years was the source of the water supply. In the near vicinity of the barracks were ravines much frequented by camp followers for purposes of nature. When I first did duty with H.M. 55th Regiment, which then occupied them, an average strength of from 1000 to 1200 men were quartered in blocks that, according to modern sanitary requirements, were only fit to accommodate 700. I have already, in the lecture on Enteric Fever, quoted Superintending Surgeon Cole's terrible description

of the barrack latrines, and their effect on the health of the inmates. It is not too much to say in the course of the many years these ill-placed, badly-constructed, and always overcrowded buildings were occupied, their very walls became saturated with the contagium of the most deadly form of dysentery to be found in all India. I need not repeat in detail the loss of life they directly and indirectly caused. The mortality was seldom less than one in every five attacked, and has often been as high as one in three, and large numbers who did not die had a worse fate, sinking into the miserable condition quoted from the Report of the Royal Commissioners in the opening sentences of this lecture.¹

The evil did not stop there ; the regimental hospital in which the cases originating from the causes explained were treated, became, like the barracks, a source of infection ; it could not well be otherwise, for it seldom contained less than 50 cases in the various stages of dysentery. Disinfection of stools was then never thought of, and, as the excellent medical officer under whom I served made it a point of conscience to see every evacuation passed between one visit and another, you can understand that a "privy atmosphere" too frequently pervaded the wards, the penetrating and persistent nature of those excretions, justly styled by Parkes

¹ Dr. Clouston records in the *Medical Times* of 3d June 1865 an outbreak of dysentery in the Cumberland and Westmoreland Asylum, due to the effluvia from a field irrigated with sewage. The diet of the inmates seems to have been entirely deficient in fresh vegetables ; the disease excited, as above mentioned, assumed, as we might expect, the scorbutic form.

“the most offensive of the organic effluvia,” was everywhere present at certain hours; and I am convinced that it was from this source the disease spread, as I often knew it to do, to patients who were in hospital for trivial ailments. In short, I believe that the infective property was everywhere in that building; in the walls, the wooden bedsteads, the bedding, and above all in the utensils in hourly use by the sick. Let me say before I pass from this subject that these vile buildings died hard. The medical officers of the many regiments quartered in them had one and all condemned them, and inspecting officers had supported this condemnation through every channel open to them; but they held their ground, until at last their terrible history was made the subject of parliamentary discussion; then, and not till then, a Commission was appointed to make a final report on the subject. Of this Commission I had the satisfaction to be a member (1859); judgment went against them, and before my connection with that part of India ceased, I stood beside Mr. Bushby, the Resident at the Court of Hyderabad, and saw the first stone of the palatial barracks of Timulghery “well and truly” laid. Before they were completed, the mutiny of the native army of Bengal broke out, which delayed the final abandonment of that dysenteric pest-house for some time. If you want proof that the disease had its origin in the place I have assigned to it, you have it in the fact that, with few and rare exceptions, it was confined to the men quartered in the barracks; the officers did not suffer from it.

As I have more than once remarked to you, bowel complaints tread in the footsteps of war ; more especially when war is waged, as in the pre-sanitary age it always was, regardless of common sense on matters of health. Deeply engraved on my mind is the terrible first occupation of the island of Chusan in China, in the war of 1840 with that empire.

In the month of July in that year I saw the 26th Regiment (Cameronians) disembark on that island 900 strong, in high health and efficiency ; they had the misfortune to lose their commander some weeks before : a war-bred man of great experience, who was a " father " to his men. The 26th came on this service direct from Bengal. In the midst of the hot weather the meat for their use was killed and salted. As might have been expected at such a season the process was, unavoidably perhaps, very imperfectly effected. It was most of it, in fact, half-putrid when the regiment disembarked. Common sense dictated its immediate destruction. This was not the opinion of the general who, in virtue of his seniority, now assumed the command of the whole force. This officer thought the waste of so much " human food " bad economy, so it was decreed that the Cameronians should eat it. The regiment was quartered in the small town of Tientsin, the capital of the island, without the ceremony of any previous cleansing. The result soon appeared : fever and scorbutic dysentery for all war purposes destroyed that regiment in two months : not 200 of the men at the end of that time remained fit to bear arms.

Do not suppose I take any pleasure in recalling such miserable episodes in our military history as the one I have just related. I am sent here to teach you military medicine, and I must teach you, not by precept only, but by examples, which are written for your learning. The survivors of the first occupation of Chusan are few, the remembrance of what they saw can only pass away with themselves; it was indeed "a spectacle of distress of as pitiable a kind as can be found in the history of human suffering." I have often thought if what happened then could have been as vividly presented to the public at home as was afterwards done on the larger field of the Crimea, the advent of sanitary reform in war might have been hastened by many years, and our annals might have been spared that sad record of ineptitude and suffering. War at the best is a terrible thing, but such scenes as those I have slightly touched on—indicated rather than described, are not unavoidable. Let us rejoice that we are now not only allowed but enjoined to mitigate its horrors, which your predecessors were not.

The above, then, are the chief factors in the causation of this disease in hot climates, so far as I know them. To recapitulate, they are, malaria and, what that poison brings in its train, febrile disturbance, with hepatic congestion and impaired digestion, irritation of the mucous membrane, and inflammation of the solitary glands of the large intestine. Impure drinking-water, the effect of chills in malarial regions, the massing of men in overcrowded, badly-situated barracks, pervaded by a fæcal

atmosphere ; more particularly proceeding from ill-kept latrines, into which the secretions of dysenteric patients have been cast, unsuitable food acting as an exciting cause in aid of the above, acting also as a putrid or scorbutic element on complication.

Morbid Anatomy.—Opportunities of observing the first anatomical signs of dysentery are only afforded when patients in the first stage of the disease die from other causes, when hyperæmia—that is, retention of blood in the mucous and submucous tissues probably present the only morbid appearance. The lesions in dysentery are, as a rule, confined to the large intestine ; the exception is in scorbutic dysentery, when they pass beyond the cæcum and extend into the small intestine ; the parts most affected are the descending colon and rectum, but often the whole extent of the great gut is implicated.

It is now a well-established fact that the morbid anatomy of tropical dysentery is essentially the same as is observed wherever the disease prevails, that the difference, where a difference exists, is one of degree only. Much of the confusion that undoubtedly is to be found in the descriptions given by authors appears to arise from the different stages of the affection in which the morbid appearances have been seen and described. It is to Parkes the discovery is due that the solitary glands are the commencing seats and centres of ulceration in dysentery ; these structures, distributed over the surface of the colon, “ present the appearance of round opaque bodies, without apparent orifice, embedded in the mucous

membrane, and even apparently attached to the sub-mucous cellular tissue." It is in and around these glands that ulceration mostly begins. In the beginning of the process they are enlarged, distended with a whitish material, compared by Parkes to a mixture of flour and water, sometimes bearing on their summits "a small black point"; as the disease advances these glands become prominent and surrounded by a vascular ring, and ulceration begins either at the apex or around the glands, the mucous membrane pressed upon by the hypertrophied gland has its vitality destroyed and ulcerates, or the ulceration may commence "by effusion of fluid beneath the mucous membrane." This effused matter is of a white or yellowish colour, raising a portion of the mucous membrane softened in its texture easily rubbed off exposing an ulcer. In acute dysentery proving rapidly fatal, the following is the usual condition observed: The cæcum and colon thickened throughout by exudation between the tunics, the solitary glands will be seen standing out with their white contents and black points; the intervening membrane crowded with ulcers in various stages and of all sizes—some not larger than a pin's head, with raised edges, others in a more advanced stage, the edges more reddened and no longer raised, the mucous membrane softened, not always reddened, sometimes of a dark colour, and, as in many of the preparations on the table, presenting a more or less mammillated appearance; the ulcers will be observed on the plicæ of the mucous surface, running along them in an elongated form.

Morehead attributes this to the effect of inflammation in the early stages, stimulating the muscular coat to increased contraction, and so disposing part of the free mucous membrane to arrange itself in transverse folds. You will observe this form of ulcer in almost all the preparations on the table. Hardly any of the ulcers will appear exactly alike; they will naturally vary according to their stage; on the surface of some a deposition of lymph will be seen, others will have a grayish coloured slough; in others, this thrown off, they will have the muscular coat for their floor, and around some of the ulcers the granular exudation of which I have presently to speak will be observed.

As I have shown, Dr. Parkes, as the result of his dissections in Burma, was of opinion that the ulceration always began around the solitary glands. I do not know that to us as practical physicians the point is one of more than merely *post-mortem* interest; but calling to mind the cases examined by the late Dr. Shanks and myself in the Secunderabad hospital, probably of a much severer type than those seen by Dr. Parkes in Burma, nothing was more common than to see cases in which patches of the softened mucous membrane of varying size were found partially detached from the submucous tissue, hanging in a gangrenous condition and easily separated, leaving large ulcers of varying shapes, with floors presenting the different appearances I have described; some covered with pus, others with black or gray fungous-looking sloughs. This, I suppose, is pretty nearly what Morehead describes as the lesion following "submucous suppuration."

You have on the table before you specimens of the exudative process seen more or less in nearly all cases which come to the *post-mortem* table, and the preparations before you exhibit this in almost every possible degree. With a few rare exceptions there is thickening of the intestine from exudative matter deposited between the coats of the intestine, giving a thickness sometimes of a quarter of an inch to the intestine: a condition in emaciated subjects that can sometimes be made out during life. I have elsewhere referred to the case of an army surgeon, who was a patient of mine in this house, who used to compare his colon to an "office ruler." In the two tall jars before you, you have the whole extent of the great intestine taken from the bodies of two men who died of dysentery contracted in China. You observe the thickening of the intestine to be very well marked, and in addition the whole lining surface in both preparations is covered with solid fibrinous, bran-like masses of a yellowish colour. The bottom of both jars is nearly covered with portions of this exudation which has become detached in the process of maceration in the spirit, leaving in some places ulcers, in others the thickened and softened mucous membrane. I have never seen cases presenting this exudation in such a fully developed state; on the table in some of the preparations you see patches of it, in others it surrounds the ulcers; but in none of them is the whole intestinal mucous membrane covered as in the preparations from China. In the sloughing dysentery of the Hyderabad barracks I never saw anything of the kind, and in this

museum, so rich in the morbid anatomy of this and other diseases of the tropics, are there any specimens quite like them.

The following is my colleague, Professor Aitken's summary of the processes from which ulceration may proceed: (1) After intumescence, softening and simple ulceration of one or of several lenticular solitary glands; (2) After intumescence and sphacelus of many solitary lenticular glands, and the intervening tissue in one mass; (3) After softening of the tubular structure and the detachment of sloughs, ulceration follows the intumescence and germination of growths from the tubes which cover the surface as a "crupous," "catarrhal," or diphtheritic exudation, to which the name of "apthous erosion" has been applied; (4) After submucous inflammation and new growths, with fibrinous and mucinous effusion; (5) After intertubular inflammation, and inflammation surrounding the base of inflamed glands; (6) After the formation of submucous abscess; (7) By changes of an ulcerative nature, commencing in the vascular exudation itself, as in scorbutic cases.

I now show you casts of the intestine thrown off in the course of the disease, some of large size, others merely in shreds: a raw surface is left. The process is said to be analogous to similar phenomena in croup, diphtheria, and typhoid fever. The passage of these tubular casts is effected with much straining, and causes alarm. I have often been told by patients when my attention has been called to an evacuation containing them, more particularly when in the tubular form like

some of those I show you, "I cannot get well now, I have passed a part of my bowels." Some blood almost always follows the separation of these exuvia, adding to the alarm.

Here also are specimens of penetrating ulcers of various sizes. The process of ulceration has extended through the whole exudation, penetrating both the mucous and peritoneal coats; these are all taken from chronic cases of long duration. You will observe also in many of the preparations before you, that the mucous membrane presents various shades of colour from slate to black; the melanotic exudation presenting sometimes in masses chiefly in the sigmoid flexure of the colon, in others the white gut presenting this dark grumous appearance. This state of the intestine is believed by pathologists to be due to "intense vascular action," and "subsequent changes in the extravasated blood" (Aitken).

The late Dr. Goodeve of Calcutta made valuable observations, by examining the evacuations at different stages. This he did by carefully washing the faecal matters from the sediment, which consists of ropy, gelatinous, brawny, or thready mucous; lymph in the shreds or granular masses, pus, faeces, and sloughs. On the table hung up behind me you will observe how he classified the exuvia, and the lessons he drew from them.

(1) *Ecchymosed sloughs* indicate abraded or minute ulcers; (2) *Compact gray or light yellow sloughs* indicate acute phlegmonous dysentery; (3) *Thick pus-infiltrated mucus* indicates erysipelalous dysentery; (4) *Ragged*

sloughs denote gangrene ; (5) *Dark olive sloughs* denote secondary gangrene of mucous coat ; (6) *Thin, black, plain, or tubular sloughs* denote gangrene in either mucous or cellular coat ; (8) *Molecular or putrilage* indicate disintegration of tissue ; (9) *Flaky epithelial sloughs* denote gangrene of mucous membrane ; (10) *Shaggy sloughs* indicate violent inflammatory action ; (11) *Free filamentous (simple) sloughs* denote primary gangrene in submucous tissue ; (12) *Free filamentous pus-infiltrated sloughs* denote submucous cellulitis ; (13) *Ring-shaped sloughs* denote ring-shaped ulcerations in mucous folds ; (14) *Discoid sloughs* indicate circular ulcers in ecchymosed patches.

In the rapidly destructive sloughing dysentery of Secunderabad, under the conditions I have described, it was not uncommon to see the mucous and muscular coats of the colon throughout one or more of its divisions present nothing but a gangrenous mass, in which it was impossible to distinguish a shred of healthy tissue.

Cicatrization of the ulcers of dysentery in different stages is to be seen in all but the extreme cases just referred to. There is reason to believe that this process is often effected rapidly. Parkes records the case of a man who was five or six days under treatment for dysentery ; his stools had become feculent, and he was allowed to get up. He exposed himself imprudently to the sun, was sun-stricken and died. In the sigmoid flexure of the colon were several ulcers, round, and with slightly rounded edges, evidently in an early stage, from

their size and appearance; the edges were pale, the intermediate mucous membrane natural, the healing process had commenced, on each was a deposit of lymph. This lymph is deposited over the whole surface of the ulcer until it rises to the level of the surrounding tissues, contraction then takes place, with some puckering of the surrounding mucous membrane. These cicatrised ulcers can be distinguished by their smooth glistening appearance, and by the slight contraction round them. It was Parkes who first accurately described the process. As Ewart has shown, the cicatricial tissue is devoid of solitary and tubular glands, and sparingly supplied with blood-vessels.

In bygone years stricture of the gut was not an uncommon occurrence in some of the victims to chronic dysentery, from constriction of the intestine, the result of contraction after cicatrisation of large circular patches of ulceration.

The solid viscera of the abdomen do not escape. The intimate relation between dysentery and pyæmic *abscesses* (for they are seldom single) of the liver, to prevent repetition, will be dealt with fully in the lectures devoted to the tropical diseases of that gland. It must suffice here to state that the frequency of this formidable complication or sequel varies in different parts of India. Dysentery has always been a more fatal disease in the Madras Presidency than either in Bengal or Bombay, the mortality having been enormously swelled by its fatal prevalence in Secunderabad. In the same Presidency liver abscess in cases of dysentery has in

bygone years amounted to nearly 60 per cent, while in Bengal proper it has varied from 13 to 18 per cent. It is a common sequel of dysentery in Algeria. It is a notable fact that although the dysentery which prevailed in the Millbank Prison was in most of its symptoms and lesions not to be distinguished from the dysentery of India, there was not a single liver abscess in Baly's cases. Dr. Aitken, who was pathologist at Scutari during the Russian War, 1854-57, found hepatic abscess of rare occurrence. If it be true, as I believe it is, that malaria plays an important part in the causation both of liver diseases and dysentery, it goes far to explain the fact that, in at least half the cases of dysentery, the liver is functionally deranged.

The intimate relation between dysentery and malarial fevers accounts for the frequency of splenic lesions. I have never seen an abscess of this ductless gland in India in a case of dysentery, but other observers have seen this lesion, which is rare. Enlargement and softening, as well as enlargement and induration are common. In some severe cases of dysentery albumen is found in the urine; it is always a sign of evil omen, particularly when seen early in the disease. The morbid anatomy of the kidneys in such cases is, on the authority of Zimmerman, quoted by Aitken, acute congestion, the tubes being loaded with exudation cells and detritus.

LECTURE XI

DYSENTERY (*continued*)

Symptoms.—As might be expected in so serious an affection, the symptoms indicating important intestinal mischief are preceded by those of general derangement of the system, particularly if the coming attack is one in which a large part of the intestine is threatened. Speaking generally, these are loss of appetite, *malaise*, a sensation of chilliness, and very often a notable depression of spirits; soon uneasy sensations in the bowels succeed, urging the patient to go to stool, when the feculent contents are wholly or partially expelled; or what at first appears an ordinary attack of diarrhoea sets in, soon attended with griping, the stools being watery and hot. The tongue is foul, and there is a bad taste in the mouth. Chilliness amounting to slight rigors and followed by heat of skin succeed; it will be well for the patient if at this stage he seeks advice and acts on it. A little judicious medication, rest in the recumbent position, a *hot* bath to restore the suspended action of the skin, followed by great care in diet, may arrest the disease at this stage.

It is seldom, that in barrack life among young and inexperienced men, the physician has an opportunity of dealing with dysentery in this its early manifestations. It more often happens that relief is sought in the use of the first stimulant available. Up to this time there has been nothing in the nature of the evacuations that can be said to be dysenteric. There is now a change; the patient becomes feverish and restless, and the pulse more frequent; the calls to stool become urgent, and with every stool there is tormina and tenesmus; this painful straining increasing with every motion. The more the lower part of the bowel is affected the greater is the tenesmus. The bladder is soon affected when the rectum is much implicated, giving rise to dysuria, sometimes to retention. Of this symptom I shall have more to say presently. Griping and tenesmus go on increasing, the patient being hardly off the close stool before he desires to return to it, always under the impression that he is about to void something that will relieve him. Under this discipline the restlessness increases, nervous depression sets in, the face becomes pinched and anxious, the pulse increasing in frequency decreases in force and volume; there is abdominal tenderness which is general, but in the interval between the paroxysms the pain can be localised by careful palpation. Meanwhile, what of the stools? They have changed their character altogether, and distinctly indicate the progress of the intestinal mischief; they are now scanty, consisting of mucus and blood, or in barrack language "slime" and blood, the source of which is the

inflamed glands, with shreds of exudation and a little feculence; they begin to give off the peculiar odour of dysentery, due, it is believed, to the contents of the ruptured solitary glands; for this peculiarly offensive odour is not perceptible until this muco-gelatinous secretion appears in the stools. At this stage the disease is still amenable to judicious treatment before ulceration has made much progress; this is the stage at which, in hospital practice in the East, patients are frequently first seen—not seeking relief until sheer suffering drives them for advice. The stools become more frequent, more offensive, contain more exudative matter, soon followed by sloughs with more or less blood, the depression becomes more marked, the pulse more frequent, the countenance more pinched and anxious, the abdomen more hard and tender, the skin grows clammy, emaciation proceeds rapidly; the stools become more offensive and contain shreds and sloughs of greater size. It is at this advanced stage that a sudden change takes place in the stools; as I have elsewhere shown, they become serous, of a brownish colour, copious, exhausting the patient terribly, and insupportably foetid, cadaverous, pervading the whole ward, even penetrating into neighbouring rooms; the abdomen becomes more tumid, but pain ceases.

The patient sometimes flatters himself that all is well with him, deeming the cessation of pain a favourable symptom; by and by his mind begins to wander, and, as if in some degree to compensate for past sufferings,

his delusions take pleasing forms, and he dies exhausted without more pain.

This is the ordinary course of acute dysentery in a case that has been unchecked by treatment, or has had no judicious treatment at all. You know enough of the description of disease to be aware that a teacher can only sketch in the leading outlines in his description; you must be prepared to meet with cases that will not at all points answer to a general sketch of this kind. The symptoms, while still in the main corresponding to the typical case given, may differ in some of the details. In one case the disease may be confined to the rectal and sigmoid divisions of the gut, when the symptoms will indicate this localisation by the severity with which pain is referred to these regions; or a much larger part of the intestine may be implicated, giving rise to constitutional disturbance of a more marked kind, and to pain more diffused; or the malarial element in the case may modify the febrile symptoms, increasing their severity, and giving to them that periodicity to which I have more than once referred. It is in such cases that you must be prepared to see a marked disposition to hæmorrhage at the time of the separation of the sloughs; or again, the symptoms may be affected by the presence of scurvy, in which case the diseased action will not be confined to the great intestine, but, passing the ileo-colic valve, will implicate more or less of the small intestine, and change the character of the stools, which will be much more copious from an early period, frothy, and voided with more force. At the

same time the gums will give evidence of the presence of this diathesis, as will the skin, which will present either scorbutic blotches or minute purpuric spots, as if red ink had been spattered over the surface with a pen.

It is needless to say that the disease may stop far short of death as described; in the vast majority of the cases it will yield to judicious treatment at various stages, or the acute symptoms may glide into the unhappy condition known as chronic dysentery, to be presently described, with or without pyæmic abscesses of the liver.

Diagnosis.—This is not difficult; the only disease with which it is likely to be confounded is diarrhœa. The presence of tormina and tenesmus, the bloody and slimy nature of the stools, the presence of the dysenteric exuvia described, and the characteristic odour of the evacuations, and the nervous depression, always more or less present, mark it off with sufficient distinctness.

Prognosis—Favourable—(1) The original slightness of the attack; (2) The absence of much nervous depression, and other grave signs of constitutional disturbance; (3) A pulse of good strength and moderate frequency; (4) The absence of tympanites, not much abdominal tenderness, absence of sloughs and gangrenous odour; (5) Early appearance of feculence, with diminishing tormina and tenesmus; (6) An improved expression of countenance; (7) Absence of signs of hepatic complication.

Unfavourable.—Failure of the nervous and circulatory systems, a pulse increasing in frequency and failing in strength, an anxious countenance, restlessness, increasing fœtor of the stools, sudden subsiding of pain without other signs of improvement, hæmorrhage from the bowels, hiccup, black and dry tongue, suppression of urine, delirium.

I spoke to you of the distressing urinary symptoms which are often observed when the rectum is much affected by the disease; this leads me to relate to you a case which caused us much distress in this school and hospital. A medical officer of more than great promise, I may say the most highly educated man who ever passed through this school, had just completed his course of instruction here when he joined the expedition to Abyssinia under General Napier, afterwards Lord Napier of Magdala. He had a sharp attack of dysentery during the campaign, and wrote to me with great satisfaction of the speedy manner in which the attack passed off under the treatment he had been taught at Netley. When this little war was over he returned to Netley, at his own request, as an officer on the staff, and immediately occupied all his spare time in assisting my late colleague, Professor Parkes, in the laboratory. In a few months he came to me complaining that his dysenteric symptoms had returned; he was at once put under treatment medicinal and dietetic for that disease. I pointed out to him that while his stools were not wanting in some of the appearances characteristic of dysentery, there was not a trace of

the odour so invariably present in true dysentery. The symptoms pointed unequivocally to rectal localisation, and obstinately resisted all treatment, after anxious consultation with my colleagues, Professors Parkes and Aitken. After a time urinary irritation, frequent calls to micturate by day and night, became a troublesome symptom, the urine being normal; as the case went on signs of constitutional disturbance became evident, loss of flesh and colour; in a word, everything pointed to the existence of malignant disease in or in the vicinity of the rectum. Careful digital examination gave only negative results. Finally fæcal matter appeared in the urine; the case went from bad to worse, and after a prolonged struggle the patient succumbed. Examination after death revealed the presence of a large cancerous mass between the bladder and the rectum high up, and beyond the reach of digital exploration, with, of course, communication with the bladder.

If recovery or death does not result from such an attack of acute dysentery as I have described, the patient sinks into the lamentable condition of chronic dysentery, which I have now to describe to you.

This, when seen in an extreme degree, is the class of cases described by the old army surgeons, and already more than once referred to as presenting "a spectacle of distress of as pitiable a kind as can be found in the history of human suffering."

Chronic Dysentery.—As the patient sinks into this

condition he continues to lose flesh ; the stools, still maintaining much of the dysenteric odour, are for the most part fluid ; but they vary from day to day, and even on the same day, being sometimes muciform, serous, and bloody, at others pultaceous, puriform, rarely if ever formed. Most commonly they consist of thin feculence of a reddish brown colour and offensive odour. If there is a scorbutic complication they will be more copious, pale, and frothy, and voided with force. Control over the sphincter is impaired, sometimes lost. The appetite is capricious or bad ; the tongue red, smooth, glazed, and devoid of epithelium, and the patient is imperfectly nourished ; the hair becomes thin, and he looks older than he is.

The symptoms will vary according to the nature of any complications that may be present—the malarial, syphilitic, or scorbutic cachexy—or by the presence of hepatic abscess. It is needless to add that much will depend on the injury done to the mucous and glandular structures of the intestine, the extent and number of the ulcers in a state of abortive cicatrisation, the thickening or atrophy of the intestine ; this last being the most hopeless of all the lesions left by the disease. Much also will depend on the extent to which the spleen and kidneys are implicated.

Treatment.—I have no words sufficiently strong to impress your minds with the importance of early treatment. Where the physician, as in military and naval life, is responsible for the health of large bodies of men

in barracks, ships, or camps, no pains should be spared to ensure it.

The evacuations of the sick should be from first to last received in glazed vessels well charged with some colourless disinfectant, and so disposed of as not to pollute the soil or the source of the water supply. After what I have said on the subject of preserving such evacuations for inspection in hospitals, it is clear there is risk in so doing. In India educated and trained subordinates are always on duty. A note of the nature of the discharges in each case should be made for the information of the medical officer, and they should be at once removed and disposed of. If it is desired in any particular case to make a microscopic examination of the dysenteric exuvia, after the manner of Goodeve, the attendants should be instructed how to wash and prepare them for this purpose. An abundant quantity of water, charged with some disinfectant, is added to the evacuation, allowed to stand for a little, and then carefully poured off; the process is repeated again and again until all feculence is washed away, and the dysenteric exuvia left cleansed for examination.

In cases where dysentery has followed exposure to wet or cold or both, it is obviously a matter of importance to restore the function of the skin. The simplest and safest plan of effecting this is to place the patient in a bath at a high temperature, keeping the patient in it until signs of approaching faintness appear, drying him quickly, and placing him between blankets. My late and much valued friend Morehead wrote dis-



paragingly of this plan ; but I cannot help thinking that in his trials the man was brought to the bath, instead of the bath to the man—to his bedside, in fact—which makes all the difference between a good and a bad remedy. If at the onset of the disease the feculent discharges are scanty, and evidently a source of irritation, it will be well to aid Nature in her efforts to get rid of them. I agree with Ewart that for this purpose a tepid water enema of from 2 to 4 pints is the simplest, safest, and least painful mode of effecting this purpose. The utmost gentleness is required in the use of the syringe, and the water should be thrown up slowly. With a view to lessen the risk of chill, the enema should be given before the bath, or if after, the bed-pan should be insisted on when it is being passed.

The patient should now be brought under the influence of ipecacuanha as soon as possible ; 15 drops of the tincture of opium or liquor opii should be given in a little chloroform water. The abdomen should be covered with a treble fold of flannel, or a sheet of spongio-piline, wrung out of hot water, and sprinkled with a little turpentine, and covered with some waterproof material. In half an hour after the administration of the opiate, the ipecacuanha should be given in a full dose of not less than half a drachm. The patient should be ordered to lie quiet on his back, and to abstain from drinking—if thirsty, a little ice may be sucked ; this invaluable remedy, given in this way and with the above precautions, rarely excites vomiting, at all events until an hour or so after it is taken,

when sometimes there is some watery fluid brought up, without any of the powder. The drug may be given in a soft bolus made up with a little syrup of orange peel, or to those who are adepts in the art of pill-swallowing, in that form, or in capsules, which excite less disgust. It is certain that when given in full doses it causes much less nausea and discomfort than when administered in small doses, as was the custom when first I was taught to use it in dysentery. A diminution in the number of stools and also in the suffering from tormina and tenesmus will certainly follow even the first dose; I have often seen the stools from 20 or 30 in 24 hours, reduced to 4 or 5. In from 8 to 10 hours the dose should be repeated in the same way, not neglecting stimulation of the external surface. The question of continuing the use of the remedy must be determined in each particular case by its effect on the general and local symptoms. If the calls to stool are reduced to 2 or 3 in 24 hours, and losing their dysenteric appearance have become feculent, and are voided without tormina and tenesmus, if the restlessness has been calmed and the patient obtains refreshing sleep, and the pulse resumes its normal frequency, or distinctly tends that way, the large doses should be discontinued; the patient should maintain the recumbent position until every trace of the abdominal irritation has subsided; the diet in the acute stage should consist of iced milk, with a little lime-water—then well-boiled arrowroot or tapioca, advancing to chicken and beef-tea—an excellent nutritious and unirritating article of

diet is well-boiled macaroni. A return to solid food should be made with great caution. If any looseness of the bowels remains, it should be met with small doses of Dover's powder at bed-time, a mild infusion of one of the vegetable astringents in fresh-made mucilage, or some bismuth. A formula like this will answer very well: Bismuthi Carb. ℥iii., Mucilag. Recentis ℥iss., Liquor Morph. Hydrochlor. ℥iii., Aquæ ℥ij. Misce—Ft. Mistura—a teaspoonful three times a day. Remembering all I have said on the scorbutic complication of dysentery, you will not fall into the old mistake of rigidly excluding the vegetable element from the patient's diet. The reputation of Bael-fruit in dysentery rests not, I am sure, on any astringent property it may possess, but on its being a pleasant and effective corrective to this tendency. To our scorbutic patients with dysentery arriving from sea at Netley, we give whatever fruits may be in season, grapes excluding stones, which may be a source of danger from getting entangled in an intestinal ulcer and causing perforation. One young officer at Secunderabad lost his life in this way through a perforating ulcer of the colon, in which a large grape-stone was found. Surgeon-General James Mouat will remember the case well. Strawberries, stewed apples, all answer, used in moderation. In tropical climates suitable fruits are always available.

I have already given Dr. Docker his due meed of praise for the service he did in recalling practitioners to the right use of ipecacuanha; it was originally introduced into this country, not for its emetic properties at

all, but as the *radix anti-dysenterica*; it was used for this purpose time out of mind in Peru. Helvetius, in the year 1653, covered the walls of Paris with advertisements announcing his possession of an infallible cure for dysentery, very much in the manner of our own "pill and ointment" men; with this he treated and cured the Dauphin of France, for which, and for his secret, he was rewarded with 1000 louis d'or. It was introduced into this country in 1660 or thereabouts, and appears to have been much used. It fell into disuse. It was a Mr. Balmain who, in the fifth volume of the *Memoirs of the Medical Society of London*, again called attention to it. In 1813 Mr. George Playfair, of the Bengal Medical Service, published a paper in the *Edinburgh Medical and Surgical Journal*, on the good effect of a combination of ipecacuanha and laudanum in dysentery. Surgeon-General Cornish exhumed from the old records of the Madras Medical Board, a document which shows that Dr. Abercrombie, of H.M. 34th Regiment, so far back as the year 1807, successfully used ipecacuanha in large doses in the treatment of dysentery, and that he communicated this mode of treatment to Mr. M'Mullens, surgeon of H.M. 39th Regiment. This gentleman had treated the disease in the mode then prevalent, by bleeding, mercury internally and externally, blisters, and such like means, with the usual results—a high death-rate, and in the cases which did not die, great debility, lingering convalescence, and frequent relapses. After taking to Dr. Abercrombie's method, he appears hardly

to have lost a case, and to have won for himself a high reputation as an exceptionally skilful physician. It further appears that Abercrombie himself learned the use of the *radix anti-dysenterica* from a gentleman of the name of Graham, who had served on the west coast of Africa.

How this remedy, almost deserving the name of a specific, came to be superseded by calomel and opium in the treatment of dysentery in the East is one of the most curious questions in the history of tropical medicine. It was my good fortune to do my probationary duty on first arriving in India under the late Dr. Mortimer of the Madras army, a gentleman who had the rare merit at that time of having cleared his mind of the degrading mercurial superstition which almost amounted to fetichism. Dr. Mortimer knew the true power of quinine over malarial fevers, and used it; and he taught me to treat dysentery with ipecacuanha, generally, however, only in small doses of 5 or 6 grains every four or five hours: a method I need not say inferior to the full doses once more in use, which he gave only occasionally, but a hundred times more effective than the method based on the constitutional action of mercury.

It was while serving in the Mauritius that Docker rendered to the British soldier the inestimable service of reviving the use of ipecacuanha in full doses. Dysentery, under the unsatisfactory treatment so often referred to, was in his hands attended with a mortality of from 10 to 18 per cent. Under the ipecacuanha treatment he

lost only 1 out of 53 cases, the fatal case being complicated with hepatic abscess, thus reducing the mortality to something less than 2 per cent. If you look at the tables behind me, you will observe how year by year the mortality fell as the use of the remedy spread, until now that it is universal, we see 500 cases treated with only 2 deaths, and this, too, in Southern India, the very quarter where this disease was most destructive.

How does this remedy act? Dr. Ewart in a few words answers the question for you at least in its practical bearings: "It is a non-spoliative antiphlogistic, a certain cholagogue and unirritating purgative, a powerful sudorific, and a harmless sedative to the heart and the muscular fibres of the intestines." Where it fails it is because it has been given too late, when structural changes incompatible with life have taken place in the affected intestine, or from structural disease of spleen, liver, and kidneys, or the combined ravages of the malarial and scorbutic cachexies.

It may be given with absolute safety to pregnant women. I add my testimony to that of Ewart on this point, based on a large experience of its use in this class of cases.

Children of the most tender age in the East are liable to dysentery under the influence of malarial and dietetic causes, aggravated by dentition; for them ipecacuanha is as great a boon as it is to adults. For an infant of six months half a grain rubbed up with twice as much bicarbonate of soda and a little sugar of milk is enough; a grain with twice the amount of alkali for every year of

age is about the rule ; it should be repeated at proper intervals until the desired effect is attained. The rules given for the diet of children with diarrhœa are applicable here. May I add a word of caution as to the necessity of watchful care in the acute diseases of children in India. Parents will forgive, if they cannot always forget, want of attention to themselves and their ailments ; but nothing more effectually and finally damages the reputation of a young physician, I suppose everywhere, in the East certainly, than failure in the nursery, more particularly if that failure can be traced to what is commonly called "want of attention," or to put it plainly, "want of care." I have only to add that in men or women suffering from dysentery, with a distinct malarial complication, evidenced by anything like distinct periodicity in the febrile movements in the course of the disease, quinine should be given in the intervals between the doses of ipecacuanha, in full and effective doses. I have used quinine in this way without having seen it in a single instance counteract the action of the ipecacuanha or aggravate the intestinal disease.

Treatment of Chronic Dysentery.—The first point is removal to a temperate climate, under certain conditions : (1) due regard to season of the year ; (2) to warm clothing ; (3) to careful dieting on the voyage. I repeat here what I have said and written times without number, that to put a malaria-struck man or one labouring under chronic dysentery on a salt ration is to poison him. Dysentery, *plus* scurvy, has sent nearly as many victims to the bottom of the ocean in the olden time as

shipwreck. Once more then, see that your patient is not scorbutic ; if he is, cure the scurvy and you go more than half-way to cure the chronic dysentery ; if you neglect this you can never cure the dysentery. If the patient comes under your care with symptoms of a relapse, or from any cause with sub-acute dysentery, treat him without hesitation as you would in a first attack. I well remember the case of a young officer landed on the pier here from India ; he was sent home for chronic dysentery ; either from exposure to cold or from some grave error in diet, he had a severe relapse, and when brought here was called to stool about thirty times in twenty-four hours. This young man was so reduced in strength that the orderlies who carried him into the house rested the stretcher on the ground several times for fear of shaking out what appeared the poor remnant of vitality left. To the astonishment of some of your predecessors passing through the course of instruction here at the time, I ordered, with the usual precautions, 25 grains of ipecacuanha ; this dose reduced at once the number of stools from thirty to five in twenty-four hours. His recovery was rapid, and about six months after his discharge, accidentally meeting him in Portsmouth, I had some difficulty in recognising in the chubby-faced lad who accosted me the emaciated being landed at Netley to all appearance in the grasp of death.

So long as there are any sub-acute symptoms milk must be the staple article of diet. Potatoes are in this condition not admissible : they cannot be digested and

cause great suffering. Nutrition without irritation must be the chief object, and variety is essential; fresh fish when available, nutritious soups, not a daily routine of beef-tea, which becomes at last as distasteful to a sick man as a glue-pot. The return to solid meat must be made with caution. Diarrhoea must be held in check by bismuth, by vegetable astringents, and by the tonic influence of the pernitrate of iron, which is much used here. Once more I commend to your attention the water-belt advised in a former lecture.

At best the cure of chronic dysentery is a work of time as well as care, and much patience both on the part of doctor and patient is required. Washing out the lower part of the bowel with a weak solution of nitrate of silver seems to assist in the healing of the ulcers.¹

¹ Just as this lecture was going to press I received an interesting letter from my friend and former Netley pupil, Surgeon-Major F. Arthur Davy. He writes to me from the Queen's Depot, Poona-mallee, near Madras; his letter is dated 29th May 1886. The following is an extract: "We have a very fine hospital here, to which all the bad chronic cases from the various stations in the Madras Presidency and Burma are sent. *In three years* there has not been a single death from dysentery. I have been here seventeen months, and very nearly lost one case. I believe he was saved by the following means: 1 drachm of nitrate of silver in 3 pints of water. I caused this solution to flow through the colon, not by injecting it, but introducing it through a long tube, carefully passed into the bowel, the fluid finding its way by gravity from the end held high above the patient. It was only done twice, and healed the ulcers. I forget," he adds, "who first advised this method."

No death from chronic dysentery in three years at Poonamallee ! Some of the old army surgeons, who now rest from their labours, and who knew that place when there was no " fine hospital " there, and were accustomed to two or three deaths in a week, would hear Dr. Davy's statement with incredulity. I cannot omit this opportunity of expressing my regret that so little serious notice has been taken in the service of this officer's investigations on the prevalence of heart-diseases in the army, and the hourly mischief wrought on the drill grounds by the drill sergeants. The late Dr. Hilton Fagge, in the second volume of his *Principles and Practice of Medicine*, was one of the few who appreciated their value.

LECTURE XII

CHOLERA

THE subject on which we enter to-day is one of paramount importance. Cholera is a disease, the interest of which is not now confined to the East and to physicians whose sphere of labour is in that quarter. While I speak, it is raging in a seaport of France, and threatening to extend its ravages to other cities in the south of Europe, and may at any moment revisit our shores. The suddenness of its attacks, the number of people it strikes down in a city or district where it prevails, the rapidity with which it kills, all tend to impress the imagination with awe, to create panic, and to arouse governments to action, with a view to determine its cause, the laws which govern its propagation, and the best means of staying its progress.

The history of this disease is deeply interesting ; but the time at my disposal will only admit of the merest outline of it. I must direct you to look up this part of the subject for yourselves in two admirable works in the library here, which will amply repay perusal. The *Annals of Cholera*, by Dr. John Macpherson, and the

History of Cholera, by Mr. C. Macnamara, both medical officers of H.M. Bengal army, will give you all that is or can be known of this history. The *Annals of Cholera*, in particular, is a work of learning and research. I commend both books to you, because the authors, in addition to the literary merits of their works, have had unrivalled opportunities of studying the disease, not in books only, but at the bedside in the hospitals of Calcutta, a city justly styled by Dr. Macpherson the "Home of Cholera."

Far from being, as was long popularly believed, a "new disease," that sprung like a wild beast out of the jungle on the camp of the Marquis of Hastings in Bundelcund in 1817, it is, as Dr. Macpherson says, one of the most ancient of which distinct descriptions exist. Its nomenclature is important. I give you from the *Annals* the names in a tabular form:—

Hindustanee .	Murree .	.	Deadly disease.
„ .	Jurree murree .	.	Sudden pestilence.
„ .	Maha murree .	.	Great pestilence.
Arabic .	Taoun .	.	Pestilence.
„ .	Duba .	.	Common for cholera and plague.
Chinese .	Ho louan .	.	Meaning sudden attack.
Sanscrit .	Visuchika .	.	Vomiting and purging.

Haidsa is the name by which it is universally known to Mohammedans. In the part of India where I spent many years, viz. Hyderabad, in the Deccan, the name in common use by all classes there was *Ookal Julab*, vomit-purge. The word found by the Portuguese in

use to distinguish the disease when they arrived in Western India was *Mordeshee* or *Morshee*, a Mahratta word, of great importance, as Macpherson shows, "in tracing the course of cholera." It was corrupted by the French into *Mort de Chien*. This word *Mordeshee*, long in use by Europeans in India, is no longer so; I never heard it out of the mouth of any one, native or European. In Tamul cholera is known as *Enerum Vandee*; in Telegoo, *Vantee*, both meaning vomiting and purging.

χολερα is the term used by the Hippocratic writers. Hippocrates and Celsus both describe cholera in a sporadic, but not in an epidemic form, and Macpherson quotes with approval the treatment recommended by the latter. Cholera is described in the Shastras as early as the second century, and epidemics at least akin to cholera were known to Avicenna. Macpherson has carefully examined the records of the various intestinal affections, dysenteries, diarrhœas, colics, choleraic affections, which prevailed in Europe from 1500 A.D. to 1817, and arrives at the conclusion that a disease indistinguishable from cholera, as we moderns understand the term, prevailed in Europe between the above dates. He quotes the description given by Van der Heyden in 1643 of the disease known as *Trousse Gallant*, called Cholera Morbus. No one reading this description who has ever seen a case of Asiatic cholera can doubt that what Van der Heyden saw was cholera and nothing else.

The Portuguese reached India in 1497, and made

Goa their seat of government in 1510. The evidence that they found cholera in Western India is as clear as any fact in history. The Portuguese writers never hint at its being a new disease, and as Dr. Macpherson shows, the evidence, which is cumulative—that is, derived from “many little facts not in themselves sufficient, but when taken together irresistible,” point to the fact that cholera was endemic in India ages before Vasco de Gamez doubled the Cape of Good Hope. Macpherson quotes a description of a frightful epidemic of cholera at Goa in 1543.

Garcia d’Orta, a Portuguese physician, published at Goa in 1563 “the earliest European work on Indian medicine; and the first book printed in India.” It is in the form of colloquies, and Macpherson quotes the colloquy in which the description of cholera is given. “The Indians,” says D’Orta, “call it *morxi*, which we corrupt into *mordeshi*. The Arabs call it *hachaisu*, which has been corruptly read by Rhazes as *saida*.” D’Orta describes the disease and its treatment, referring particularly to the use of the cautery to the ankles by the native practitioners, and to ligatures round the limbs. Macpherson uses this native treatment by cautery as a valuable clue in tracing out cholera.

It is quite impossible for me with the time at my disposal to follow out the evidence of the presence of cholera in India from the days of the early Portuguese occupation to the present, both in an endemic and epidemic form. In the times with which we have been dealing European intercourse with India was mainly

with the western coast; it is therefore not surprising that we know much less of its early history in its modern site or "home" in Lower Bengal. Mr. C. Macnamara, to whose excellent *History of Asiatic Cholera* I have already referred, has worked out the history of the temple of the goddess of cholera at Calcutta, where she was worshipped as *Oola Beebee*. From the history of this idol, whose worship was so assiduously carried on that at one time the offerings in money amounted to 4000 rupees a year, and in rice to nearly 9 tons, it is evident that cholera was a common disease in Bengal.

There is abundant evidence from the records of travels of learned missionaries that cholera prevailed in Southern India in 1713 very much as it does now, both in a sporadic and an epidemic form; and coming down to later times, the records of the Madras Medical Board show that it prevailed in that Presidency in 1769-70-1774, 1781, and 1790. It reached the Isle of France in 1775.

Macpherson expresses surprise that when a terrible outbreak of cholera attacked a division of Bengal troops at Ganjam on the 22d of March 1781, it was the cause of much astonishment. He attributes this to the imperfect communication existing in those days between one part of India and another. Jameson has left us a record of this epidemic. The disease "assailed the troops with inconceivable fury. Men in perfect health dropped down by dozens, and others, less severely affected, were dead, or past recovery, within an hour. The spasms of the extremities and trunk were dreadful, and distressing

vomiting and purging were present in all." The deaths, out of a strength of 5000, did not fall short of 700. The camp followers were first attacked, then the Sepoys, and then the Europeans. Few officers were affected, and only one died.

This epidemic reached Calcutta in April of the same year, where, according to Warren Hastings, it caused a great mortality among the native population, lasted a fortnight, and then pursued its way northwards.

In 1783 there was a terrible outburst of cholera at Hurdwar. Macpherson describes it. So far as my knowledge goes this is the first mention of this celebrated spot in connection with cholera, although on this point I speak with diffidence. It is hardly necessary to remind you that it is at Hurdwar the waters of the sacred Ganges issue into the plains; there is no place so sacred in the estimation of the Hindoos; they resort to it in numbers every year at the full moon of April. But it is only every twelfth year that the people assemble in vast numbers for the purpose of bathing in the holy stream. The number of pilgrims on such occasions often exceeds a million. In the year named cholera broke out at the beginning of the ceremonies, and Macpherson estimates the number of the victims in eight days at 20,000.

I have already referred to the popular belief that cholera was a "new disease" in 1817; enough has been said to show you that this belief is unfounded. It is not even true that there was no cholera in the years immediately preceding 1817. There was com-

parative quiescence, and that was all. There is evidence of its presence in various parts of the Madras Presidency up to the end of the eighteenth century, and a Bengal column, in April 1790, was attacked in the same place and in the same way as that of Colonel Pearse already related. In 1793 cholera was in Travancore, and in 1794 it "destroyed thousands" in the same district. Undoubtedly in and about Calcutta from 1808, 1809, 1811, 1812, 1813, and 1814 only dropping cases of the disease were seen, which attracted little attention.

We now come to the great epidemic of 1817. Dr. Macpherson and Mr. Macnamara have exploded the popular error that it began at Jessore. In May and June the disease was raging in Kishnaghur and Myensing. In July it was in the Dacca district, and it did not reach Jessore till August. It reached Calcutta a few days earlier. The consternation was extreme, and once more the temple of *Oola Beebee* was crowded with worshippers. It is a notable fact that the pestilence appeared on this occasion in the month of August, the usual cholera season being the hot weather in Calcutta. Dr. Macpherson, however, records that he saw in the month of September 1859, *i.e.* during the rains in that city, the worst epidemic of cholera he ever witnessed among Europeans, and he uses this remarkable expression, which shows his belief in the hot weather being its Calcutta season of prevalence: "the disease very soon resumed its old habits—*may be said to have soon righted itself.*" Thus it broke out again in

the end of February 1818, and raged during the hot weather months.

From the year 1845 to the end of 1855 I was attached to the Political Residency of Hyderabad in the Deccan, close to the great city of that name. In all that time cholera prevailed more or less during the hot and dry season, from March to the end of May, with the exception of one year, when there was not, so far as I could learn, a single case of the disease.

We come now to the memorable outburst of the disease in the camp of the Marquis of Hastings on the 6th of November 1817 in Bundelcund. On this occasion 5000 men perished in five days. Europeans and natives were alike struck down, and before the epidemic subsided it had carried off 9000 men. The Marquis of Hastings gave directions that in the event of his succumbing to the disease his body should be buried in his tent.

The disease reached Burma in 1818; Penang, Sumatra, Siam, Ceylon, Mauritius 1819; China 1820, 1822, 1823, and 1824 (I met with it there in 1841 committing great ravages along the course of the Yang-tsi-Kiang River); Chinese Tartary 1827.

On its western course it was at Muscat in the Persian Gulf in 1821; Persia 1822, again in 1823, 1829, and 1830; Astrachan 1823. In 1829 it was at Orenburg. By May 1831 it reached Moscow and Warsaw, St. Petersburg in July; by October it was at Berlin and Vienna, and in the same month it had established itself at Sunderland; and in the following month it

was in and about Edinburgh. It reached Quebec in 1832.

It appeared again in Europe in 1848-49, in 1853-54, and it effected a lodgment in Southampton in 1866: this being the first occasion on which the southern coast of England was invaded; the disease was raging in the basin of the Mediterranean, with which Southampton was in weekly steam communication.

The following is an epitome of its march: "It has advanced eastwards to China, southwards to Ceylon, northwards to Archangel, westwards to Britain—raging at all seasons of the year, in all terrestrial temperatures, from the highest tropical heat to the lowest Arctic cold—in all states of the air as to humidity, barometric pressure or wind, at sea and on land—on all soils from the most moist to the driest, from the most barren to the most fertile. At all elevations, from the level of the sea to the highest inhabited region, among all races of mankind, whose country has lain in its line of march; in all varieties of political condition or civil station; in short, in every variety of circumstances in which it is possible to regard human beings. Is there any disease of acknowledged miasmatic origin to which the same observation can be applied? Is there any other mode of explaining why malignant cholera seems as it were to seek man out wherever he congregates, except by admitting that he carries it with him from congregation to congregation?"

What is the cause of cholera? Gentlemen, I do not know! Far be it from me to say we shall never know

—never be able to give an exact answer to the above question. Of this, however, I am quite sure—it can never be answered by merely official authority; by throwing cold water on the opinions of those, whether right or wrong, who are seeking after truth; sneering at and snubbing, and in every way discouraging men who dare to hold opinions that do not square with those which happen, it may be for political reasons, to find favour with those in positions of medical or other authority. Something too much of this we have seen of late years. Such a system is in a high degree unjust to those against whom it is either directly or indirectly put in force, and worse than that, it is fatal to all honest inquiry and to the advancement of truth. I hope and believe we have seen the last of this bad system.

I have admitted that I cannot tell you the cause of cholera. It has been attributed to “some addition to the ordinary atmosphere”—in other words, to an aërial poison of the zymotic class; others look to the soil, to climate, food, water. Tytler, of the Bengal army, attributed the outbreak of 1817 to “diseased rice,” a mere guess, which in no way explained the facts even within the limited area to which his experience was confined, much less over the vast extent of country affected by the epidemic. Professor Hallier and De Barry about the year 1868 pressed a fungoid theory of cholera on the attention of the scientific world, which found favour with many until Drs. Lewis and Cunningham, both Netley men, appointed by the Secretaries for War and India, on the recommendation of the professors of this

school to investigate this theory, effectually disposed of it by their researches in the "home of cholera." They demonstrated that no special fungus is developed in cholera stools, and that the fungus of Hallier and De Barry is certainly not confined to such stools.

Of all the theories put forward on the etiology of cholera none has obtained such a wide acceptance as the bacterial theory of Professor Koch. A belief that the cause of cholera was to be found in some organic or even organised substance, has from time to time been entertained by some members of the profession, but Koch, after his researches on cholera in Egypt and India, is the pathologist who has put forward the theory of a comma-shaped bacillus being the cause of cholera in a distinct and plausible manner.

Koch did not succeed in finding in the blood of cholera patients any micro-organisms, only very few in the vomit, but abundance in the evacuations. In the bowels of those affected, more particularly in the lower part of the small intestine, he found immense numbers of bacilli, presenting the comma-like shape which has given them their distinctive name. This subject was investigated with his usual patience and skill by Dr. Lewis, the Cholera Commissioner already referred to, and well known to you all as at this time Assistant Professor of Pathology in this school,¹ who went to Toulon during the late epidemic of cholera there, to study the question. Dr. Lewis came to the

¹ Alas! now (May 1886) no more, adding one more honoured name to the long list of victims to science.

conclusion that this so-called cholera bacillus is a *spirillum*, and in the laboratory here was able to demonstrate its existence in the saliva of his illustrious friend Professor Max von Pettenkofer, whose observation on seeing the famous comma-bacillus taken from this unlooked-for source, was: "Lewis, you have removed a bandage from my eyes!"

This, to the best of my knowledge and belief, is the present position of the comma-bacillus theory of cholera. I think the safest verdict on it at this time is "not proven."¹

¹ Just as this sheet was going to press the following notice appeared in the *British Medical Journal* of July 3, 1886. The last word on the comma-bacillus, it is evident, has not yet been said:—

THE BACILLUS OF CHOLERA.

During the summer of 1885 an epidemic of cholera occurred at Shanghai, and proved fatal to a considerable number of Chinese residents. Dr. Macleod and Mr. Milles, who are associated in practice at Shanghai, and whose names will be familiar to some of our most experienced bacteriologists in London, with whom they were recently fellow-workers here, seized the opportunity of investigating cholera from the bacterial aspect of the question. Their full report is not yet ready; but a preliminary statement, supplied to Dr. Henderson, the health officer of Shanghai, has been printed in the Report of the Municipal Council of that settlement. The statement briefly sets forth that the investigation was entered into for the purpose of testing Dr. Koch's results; and his methods, so far as they have been made known, were employed. 27 cases of Asiatic cholera, 7 cases of diarrhoea, 2 cases of dysentery, and 4 specimens of healthy saliva, furnished the material; and the following are some of the results: 1. Koch's comma-bacillus, distinguished by (*a*) shape and size, as seen in specimens of the stools under the microscope; (*b*) vital characteristics, furnished by growth

The theory of Pettenkofer is one that has exercised great influence on the minds of the profession; it is briefly this: He takes for granted that there is "a cholera poison," which on reaching the soil undergoes

in pure cultivations, was found in 25 out of 27 cases of cholera. In two cases it was not found; but in these the stools were not collected during the stage of collapse, and were not characteristic, being fœtid and fœcal. (The bacillus found in the rice-water stools of a given case is frequently absent from the later non-characteristic stools of the same case.) 2. Microscopic examination of the stools of 7 cases of diarrhœa and 2 cases of dysentery, also of 4 specimens of saliva from healthy individuals, demonstrated the presence of comma-shaped bacilli; but the cultivation test (which had succeeded in the cholera cases) failed in every instance; thus proving them, though identical as to size and shape, to be different in the more important vital characteristics of growth under the same conditions. 3. The rice-water stools, as they are called, that is, the characteristic stools of cholera, always contained these organisms, and often an almost pure cultivation of them, few, if any others, being present; whilst, in the less characteristic stools of the later stages of the disease, they were difficult of detection and sometimes absent, there being often as many as four or five other micro-organisms present. 4. The organism was not found in the tissue of the intestinal wall, as stated by Koch; but, as he has not published his method of detecting it in that position, failure may have been due to a different method of examination. 5. The organism was destroyed by being dried, whilst it was found capable of growth after being kept moist for more than four months. Probably, it is capable of much longer preservation in this state. 6. The bacillus grew luxuriantly at a temperature of from 75° to 100° F., slowly between 50° and 60° F., little, or not at all, below 40° F., but was still capable of resuming growth when the temperature was raised. A series of experiments for the production of the disease in guinea pigs is now being conducted, but is not advanced sufficiently for report.

changes, which depend on the presence of a certain amount of moisture. Even if this condition is fulfilled there will be no epidemic unless certain unknown meteorological conditions are present, and a predisposition to the disease in those coming within the influence of the disease in the affected area.

He lays great stress on what he calls the "ground water." Cholera is worst in Lower Bengal in April, when the level of the water is lowest; in Upper India in August and September, when the water-level is either rising or subsiding. It will be seen that according to this view the soil is the *nidus* where the poison is prepared, more particularly if that soil be alluvial, allowing free intercourse between the air in the soil and that above it. Basing his opinion on the above he deems that cholera follows not the course of traffic but that of the subsoil water.

The cholera poison, according to Pettenkofer, requires earth, organic matter, salts in the soil, and water neither in excess or the reverse for its propagation. Now cholera is a great traveller; it has, as I have already shown you, found its way and exercised its destructive power over vast areas, where it is contrary to reason and to experience to suppose that Pettenkofer's conditions are to be found. It appears to me that this theory has been framed without keeping this important fact sufficiently in view.

Is cholera a child of dirt? Much may be said in favour of this opinion. That its birthplace is Hindostan does not admit of doubt,—I speak of course of Cholera

Asiatica, not of those milder affections which, having a certain resemblance to the grave and destructive disease with which we are concerned here, are to be found almost everywhere occurring sporadically, but not with the wide-sweeping energy of a disease capable, as we have seen, of destroying its thousands in a few days out of an army of moderate size. The soil of the populous parts of India where this disease is chiefly endemic has for ages been saturated and sodden with fæcal impurities. Many of the races of India may in a certain sense be said to be cleanly in their persons, regular in the performance of ceremonial ablutions. I use the term ceremonial advisedly, for in crowded centres of population it is notorious that the water with which these ablutions are performed is nothing but slightly-diluted sewage. How notably this is the case in the tanks in and about the crowded native quarters of Calcutta is a matter of notoriety, to be seen in almost every page of the reports of the sanitary officers of that city. What is true of the native quarters of the great cities of India is doubly so of the villages scattered in prodigious numbers over the face of the country. For ages the habits of the people have remained the same, and those habits in the matter of the disposal of human excreta in the vicinity of their dwellings have been such as to bring about a condition of soil and water such as those only who have made this unsavoury subject a matter of inquiry and observation can fully understand.

We know that in our own land, with our yearly-increasing population, the disposal of our sewage is one

of the most difficult and costly problems submitted to the consideration of sanitarians and engineers. What would have been the condition of this country had this question been left, as it has been in India, to take care of itself? I think the answer is not far to seek: we should in time have been admonished by some development of fæcal-bred disease as destructive as cholera, if not cholera itself in *propria persona*, not as an occasional visitor, but as an endemic disease developing from time to time, under the influence of those unknown agencies to which we give various names, into destructive epidemics, such as now sweep over large areas of Hindostan.

Nor in this connection can we shut our eyes to a fact as notorious as any fact can be, that when cholera is in movement in Europe it finds out the cities and the quarters of cities where the reign of dirt is supreme. Cholera in this country has not been an unmixed evil; it has come to us with a scorpion whip in its hand, and has scourged the communities that have understood the chastisement into, at all events, an approach to that cleanliness which is akin to godliness. Those who take its lessons to heart in earnest will probably see its terrible face no more, while those who seek to appease the wrath of an offended deity by processions of Our Lady of this and Our Lady of that, or the relics of this or that departed saint, will fare as do the votaries of *Oola Beebee*, the Lady of the Flux, in Calcutta, until they learn the worship of—Hygeia.

Propagation.—Here we enter on controversial ground.

Much as I desire to avoid controversy in my lectures here, it is impossible for me to affect neutrality on a matter of such importance as this. The official reports of the sanitary officers of India are received here, and are to be seen and read in the library; they are, moreover, carefully reviewed in the medical journals, and I think you have a right to expect from your teachers in this school a distinct expression of opinion, and not merely a colourless statement on such a question as the propagation of cholera, more particularly from the professor whose duty it is to instruct you on military medicine.

The first part of this subject to be brought before you is the theory of the late Dr. Bryden of the Bengal army, which has attracted much attention not only in India, but in Europe. Bryden defined what he called the endemic area of cholera, its breeding-place, with a precision never before attempted. This is a region in Lower Bengal, extending over 122,500 square miles, containing within its limits the deltas of two great rivers, the Ganges and the Mahanuddy. This endemic area is a flat diluvium on the seaboard, little raised above the level of the sea; its climate is hot and moist, a large part of it is yearly under water, and vegetation under the stimulus of heat and moisture is rank and vigorous.

From this region spring up "bodies of cholera," which overflow the boundaries of the endemic area from time to time, invading not only what he called the epidemic area of Hindostan, which included every

region outside the endemic area, but occasionally spreading beyond this over Asia, Africa, and Europe, which happen to be in their course; the *materies* of cholera, whatever it may be, has a period of growth, existence, decay, revitalisation, and death—these being under the influence of time, place, and atmospheric conditions. Bryden was of opinion that cholera was as much an imported disease in the so-called epidemic area of Hindostan as it is in Europe.

Under the drying influence of the sun in the hot and dry months of February, March, April, and May, the *materies* of cholera is extracted from the soil, and prevails in the endemic area more or less. The first heavy fall of rain extinguishes it there; but in years when it assumes epidemic energy it “invades” the epidemic area, taking moisture for its vehicle, and the monsoon wind for its “locomotive power.”

According to this view the earth-born germs of the disease are carried by the moist wind from their birth-place. To human intercourse—to man or his movements—or to any other agency, Bryden assigns an insignificant and subordinate part in the propagation of cholera; and he asserts that when introduced into the epidemic area by any other agency than that of the moist monsoon wind, it never assumes epidemic force.

Bryden's study of many epidemics convinced him that the disease invariably invades the epidemic area with a certain periodicity, “prevailing most in the endemic area from October to May, in the months when it fades away in the upper provinces; it is never seen

there in an epidemic form from the beginning of October until the 20th of April. The disease, appearing in an epidemic form about the above date, will last until the third week in September. A cholera epidemic in the east of India may be entirely diverted from the north-west into Western India—a change of direction which takes place during the north-east monsoon.”

Such, in general terms, is a summary of this theory which has exercised a great fascination over the minds of many men, very notably over that of Dr. James Cuninghame, for many years the Sanitary Commissioner with the Government of India. At one time this unquestionably able man held strongly opinions diametrically opposed to the exclusive theory of Bryden, and in his Annual Report for the year 1867, after describing the distribution of cholera by the pilgrims returning from the great Hurdwar Fair, he thus expressed himself: “Whatever theoretical differences of opinion may exist as to the propagation of cholera, the facts of the great epidemic of 1867, and its spread over Northern India, teach no doubtful lesson, and it is this: that human intercourse plays a very great part in the diffusion of the disease, and that returning pilgrims in particular are very dangerous arrivals.”

In 1881 the same authority expressed himself to the following effect: “The experience of fairs and other gatherings in this country (India) has again and again testified to the truth of the conclusion, that cholera is not carried by persons from one locality to another, so as to cause persons, not themselves exposed to the neces-

sary local influences, to become affected by the disease." In fact Dr. Cuningham, in the last years of his official life, made, as my colleague, Professor De Chaumont has expressed it, "*a tabula rasa* of everything, and denied the transportability of cholera by persons and by water."

It is impossible to resist the conclusion that, consciously or unconsciously, political considerations weighed with this able officer when he changed his opinions in this remarkable manner. It is certain that the Government of India was alarmed lest, if it could be established that cholera followed the great lines of human intercourse, foreign nations, in their jealousy of British commercial prosperity, should establish, to the detriment of Indian trade, quarantine regulations of an oppressive character. It is certain that both Dr. Cuningham and some of the high officials of the Civil Government lost no opportunity of expressing in strong terms their opinion, that to reason from facts before them, showing the influence of human intercourse or water in propagating cholera, on the part of medical officers, was highly culpable, and a practice to be reprobated. Any other theory than the one advocated in the annual reports of the Sanitary Commissioner with the Government of India was wrong, and the officer who sinned in this way was branded as a mischievous theorist.

I would rather have avoided any reference to this unpleasant subject, but it is part of the history of cholera in India, and I cannot pass it over in silence.

Gentlemen, when we study the history of cholera we

must not confine our attention entirely to India. I ask you to keep in mind the sketch I gave you at the beginning of this lecture of the progress of cholera from Hindostan, its indubitable birthplace. I think it will be difficult for any candid person, whatever his preconceived opinions may be, to deny the broad fact so clearly indicated, that cholera, in its epidemic movements, follows the great lines of traffic and human intercourse, that it *does* "seek out man wherever he congregates, and that he carries it with him from congregation to congregation."

Was it the wind that carried cholera from the Mediterranean to the neighbouring town of Southampton in 1866 when for the first time it invaded England on its southern shore? If so, why did the wind not deposit it on some other parts of the coast, say the Isle of Wight, which, as it happens, covers the very mouth of Southampton Water? Why was it that on board the steamship which carried it, the only persons attacked were those who drank water taken from a tainted source where the disease prevailed at a Mediterranean port? Why was it that the first case of cholera in Southampton, after the arrival of that ship, was in the house of one of the men who, having partaken of this tainted water, was suffering from diarrhoea when he landed, and afterwards had the disease in his own home? To such questions the invariable answer of the late Sanitary Commissioner with the Government of India would be "such events are coincidences."

I ask you to accept provisionally the following pro-

positions, and to act in your dealings with cholera on the practical lessons they teach, until by observation and practical experience you satisfy yourselves that they are untrue :—

(*a*) While it is certain that Bryden's dictum that the only endemic area of cholera in Lower Bengal is inaccurate, inasmuch as there are other breeding-places, it is true that in the region indicated by him, without defining its limits so exactly, cholera is more or less always present there from October to May inclusive.

(*b*) What the nature of the force is which gives it epidemic energy in certain years is unknown. Cholera certainly as a rule assumes epidemic intensity after heavy rain, followed by intensely hot weather.

(*c*) "The south-west monsoon appears to be the indirect cause of the dissemination of cholera over the country, in that it brings with it moisture—a necessary element for the development of the disease—but more especially because it is before this wind that the large fleet of country boats moves up the Ganges, conveying men and goods from the home of endemic cholera to be disseminated over the upper provinces. Thus the disease springs up, not only in the great cities on the Ganges at which these boats stop, but it also appears in the large towns on the Jumna—cholera thus progressing with man along the great high roads upon which he travels, spreading no faster than he moves, and being generated in wet and hot weather."—MACNAMARA.

(*d*) So far the influence of the south-west monsoon. But it is a notable fact that when cholera has been

raging in Burma, it has never been carried to the Andamans, in the Bay of Bengal, with that wind in its favour. There is evidence by trustworthy observers — Scott, Leith, and Cornish—that the disease can travel great distances against the monsoon, that in fact it makes its way along its track as fast with the wind *against* it as when it blows in its favour.

(*e*) The infective property of cholera is in the stools of cholera patients when they have undergone certain changes — fresh stools do not possess this infective property.

(*f*) The stools of infected persons can convey the disease through the medium of drinking water.

(*g*) It is probable that dried cholera stools (cholera dust) may be carried by the wind, and infect those who breathe the air thus contaminated. How far it may be carried in this way, retaining its infective property, is uncertain.

(*h*) Articles of food polluted by cholera dejections when taken into the system induce the disease.

(*i*) Articles of clothing soiled with cholera dejections will retain, and may communicate, the infection.

(*j*) Bodies of men, regiments, or pilgrims can carry the disease with them, and propagate it along their line of march and dispersion.

(*k*) A healthy regiment meeting and communicating with an infected one will certainly be infected.

(*l*) A regiment or other body of men entering a tainted district will almost certainly be infected.

(*m*) If it encamps on ground previously, and com-

paratively recently, occupied by a cholera-infected body of men, it will certainly be infected.

(*n*) When ships leaving port with a clean bill of health are attacked by cholera in mid-ocean, it will be found, if the cause is duly sought for, that the outbreak of the disease has been coincident with the opening up and exposure of some part of the cargo, or the baggage of passengers, from an infected place, it may be, far from the port of departure.

LECTURE XIII

CHOLERA (*continued*)

SOME evidence in support of the propositions offered for your acceptance in last lecture you have a right to demand at my hands. That the specific poison of cholera is contained in the dejections of cholera patients is, I think, demonstrated by the following fact related by Macnamara :—

“A small quantity of a fresh rice-water stool passed by a person suffering from cholera was accidentally mixed with some four or five gallons of water, and the mixture exposed to the rays of a tropical sun for 12 hours. Early the following morning 19 people each swallowed about an ounce of this contaminated water—they only partook of it once—but within 36 hours 5 of these 19 persons were seized with cholera. In this instance the choleraic evacuation did not touch the soil : as it was passed so it was swallowed ; it had been largely diluted with impure water, and the mixture had been exposed to the light and heat of a tropical sun for 12 hours.”

Parkes' *Manual of Practical Hygiene* is in your

hands,—indeed in this school seldom out of your hands, —if you will turn to page 50 of that work you will find an admirable summary of the evidence on the propagation of cholera by contaminated water, both in Europe and India. No part of that evidence is more important than that which shows how towns are protected from the disease when the water supply is pure, and how they suffer when it is contaminated; also how towns which have suffered in one epidemic have escaped a later one, the only difference being that, in the interval, the supply of water has been improved. Calcutta has certainly suffered less since the water supply has been improved, and there is the best reason to believe that when this comparatively pure supply is more generally diffused the improvement will be still more striking. As the case stands, the reports of the health officers show that it is the consumers of contaminated water that constitute the enormous majority of the sufferers. The same is true of Madras.

Take the following examples: The first was communicated to Dr. Hastings, civil surgeon of Cannanore, by the Rev. M. Delpech, Roman Catholic missionary of the district where the event happened, and published by Dr. Hastings in the *Indian Medical Gazette* of 1st December 1879. The narrative derives importance from the fact that the reverend gentleman had no theory of cholera to support, and is not therefore open to the reproach of being a “theorist,” by the scorner of all theories—his own excepted.

The village of Vendakencoulam is situated about

thirty-five miles south of Palamcottah. This village, towards the close of the year 1877, was subjected to a heavy rainfall, which by percolation filled to the brim the five or six wells which are situated in the village. Towards the second half of the month of December an epidemic of cholera broke out in the village, which in fifteen days carried off more than 100 souls of the high-caste population. Not a single person of low caste was attacked, a street only separating the two castes. In some places the abodes of the two castes were contiguous. Still, the disease only affected those of the high caste.

In the village were two wells, A and B, which, situated in the centre of the village, the high castes reserved for their exclusive use; the low-caste people dared not even approach them. At the time of the cholera the high castes used the well A; for many years it was around this well that men and women made their ablutions or health baths; there they washed the clothes they have worn for one or two days; there they purified their linen and their bodies when they have assisted at funeral ceremonies. The approaches to this well were always wet, and more or less contaminated with animal matter and foetid mud. Rice cooked in this water had a bad smell. It has been said that not one of the low-caste people died. The reporter, the Rev. V. Delpech, Roman Catholic missionary of Vendakencoulam, says: "I was mistaken—one, and one only, died of this cholera, and this was the washerman of the high-caste people. Now this man, who, on account of his caste, could not approach the well A, drank never-

theless of this water, for by a special privilege the washerman's wife got her pitcher filled by a high-caste woman.

"Suspicion therefore fell upon the well in question, and by common consent it was resolved no longer to draw water from it; from this time the disease sensibly diminished, and soon disappeared altogether. M. Delpech fairly enough asks how it came to pass that well A was more impure than those used by the low-caste people. The answer given is significant: the low-caste people performed their ablutions for the most part in their cholam-gardens, the high-caste men bathed and washed their clothes at well A. The low-caste wells were surrounded by a parapet, like those of the high castes, but unlike the latter, the water used in washing and bathing could run off, whilst at well A there was a big hole through which the foul water ran into the well" (Abridged from M. Delpech's narrative, translated from the French by Surgeon W. J. Hastings, M.D., Civil Surgeon, Cannanore, and published in the *Indian Medical Gazette*, 1st December 1879).

The next fact bearing on the propagation of cholera by impure water I give on the authority of Dr. Blanc of the Bombay army, published in the *Lancet*, 21st August 1875, p. 270.

The Yerconda central gaol is situated in the Deccan, 1865 feet above the level of the sea. At the time of the following occurrence it contained 1279 prisoners.

On the morning of the 27th May a case of cholera occurred, and by noon of the following day 20 cases were admitted. They came from nine different barracks,

and at first it appeared as if the outbreak was general, but on closer inquiry, it was discovered that the epidemic was limited to a certain number of prisoners who had lately been employed in making a new road from the gaol towards the Moola River, there to join the Poona road.

It was then discovered that the whole of the men affected had drunk water taken from the Moola River *below* the dam; the prisoners who were not affected only drank water *above* the dam, that is from a point not affected by sewage from Poona.

Cholera prevailed a little at the time, and it was established that the bodies of two men who died of cholera, as well as their clothes, were washed twenty yards above the spot where the road gang had taken water. Was this "a mere coincidence"? I have already given you evidence of the propagation of enteric fever, dysentery, and cholera in the pre-sanitary age from ill-kept privies.

Take the following example of cholera propagation by soiled clothing, on the authority of my friend, Inspector-General Arthur Anderson, C.B., at the time in question principal medical officer of Malta. That garrison suffered from a severe epidemic of cholera in 1865; the disease died out; there had not been a case for more than a fortnight; suddenly a soldier's wife was attacked and died. It was proved that this poor woman had been in attendance, during the epidemic, on a woman who died of the disease, had purloined a night-dress soiled with the cholera excretions of the woman she was

attending. After keeping this article of clothing for more than a fortnight, she put it on her person without having it even washed, was seized with the disease, and died ; this being the last case seen in the garrison.

How cholera may be propagated by food contamination is shown in the following example related by Dr. Fairweather of the Bengal army, quoted and much dwelt upon by Professor Parkes, in the Army Medical Report for the year 1873. It is impossible to read this narrative without the reflection arising that it cannot be a solitary example ; that, in fact, innumerable examples of the same kind of propagation must have taken place without record ; the habits and customs of the people are such that funeral feasts, conducted much in the same way, must have been often attended with like results.

A man arrived in Delhi from Lucknow, where cholera prevailed ; immediately after arrival he was seized with cholera, and died on the 20th of November. The floor of the room in which he died had been saturated with the cholera discharges ; this floor was said to have been "cleaned," and subsequently washed in the native manner with cow-dung and water ; the man belonged to the Reghar caste, who are tanners by trade, and live in a community by themselves. A funeral feast was given ; the hot steaming mass of rice, *dôhl* (lentil), and clarified butter was heaped on a mat, and placed on the floor, which, as above stated, had been saturated with the cholera dejections of the deceased man. The feast was attended by numerous male

friends of the deceased, of his own caste, with one or two exceptions. Some of the men took home part of the food to their wives and daughters. This feast took place on the 26th of November; a few hours afterwards an outburst of cholera took place, confined at first to those who attended the feast; by the 29th of November 47 cases and 15 deaths had occurred, by the 4th of December there were 73 cases and 46 deaths. The deaths were not confined to those who were at the feast, for be it remembered portions of the food were taken home by some of the males, whose wives and daughters partook of it; but it was confined to the community who were either at the feast or partook of the food brought from it. Dr. Fairweather satisfied himself that the water was not in fault, and that the food, purchased from a good source, was unexceptionable. There was no cholera in or about Delhi at the time, and therefore no cholera miasm could have affected the sufferers.

We are thus driven to the conclusion that the food was infected through the medium of the tainted floor.

As to the carriage of cholera by troops, pilgrims, and other bodies from place to place, the matter admits of no dispute. In Southern India, in particular, it is a commonplace of cholera experience. In that part of India, in days when regiments marched and did not travel by rail, hardly a year passed during the relief season without one or more examples of the kind. The same is true of the proposition regarding the danger of encamping on ground soiled by previous occupation of a body of tainted troops, pilgrims, or other travellers.

With regard to the danger of moving troops into a district infected with cholera, I select for illustration an example which is historical. A body of time-expired artillerymen, with their wives and families, were under orders to move from Mhow to their port of embarkation, Bombay. The medical and civil authorities intimated to the general in command at Mhow that cholera in an epidemic form prevailed in the district through which this detachment had to pass, and counselled delay. The general in command did not think it his duty to follow this advice. The march took place into the very centre of the tainted district, the detachment was immediately attacked by the disease, and a lamentable mortality among men, women, and children followed. The press of India took the matter up, commented upon this loss of life with unsparing severity; in due time it attracted the attention of Parliament, an "inquiry" followed, which resulted in the general commanding the Mhow division of the Bombay army being deprived of his command. I think it only due to that officer to mention that in his defence he was able to show that on a previous occasion he had delayed the march of troops within his command on account of the prevalence of cholera on the line of march, and was reprimanded for so doing. When a mistake of this kind is in contemplation, remember the "Mhow case," and do your utmost, by representation in the proper quarter, to prevent it.

With reference to the outbreak of cholera in mid-ocean, the believers in wind, as the sole carrier of cholera,

maintain that when an event of this kind occurs, the ship passes through a cholera-bearing stratum of the atmosphere. The sanitary officials of the U.S. Government account for the fact in a more prosaic way, and say, as the result of their inquiries, that in every instance cholera has been imported into the United States by infected passengers, and that where this has happened in the case of ships leaving European ports with a clean bill of health, passengers on board have come from infected places on the Continent, and that in some well authenticated examples the outbreak of cholera at sea was synchronous with the opening up and exposure of baggage belonging to passengers coming from such infected places.

Symptoms.—We have now to look at this pestilence in its clinical aspect. There is no disease more easy of recognition. When cholera prevails in an epidemic form premonitory diarrhoea is the rule: a point to be carefully kept in mind in dealing with the disease. This rule obtains in Europe and India alike; the term, however, must be restricted to the diarrhoea which precedes the characteristic symptoms by at least twenty-four hours.

The real attack begins with a motion which empties the whole intestinal tract of its fæcal contents; with this comes mortal faintness and vomiting of a watery fluid, in which whitish-coloured flakes are suspended; nothing remains on the stomach. The characteristic stools now appear, so closely resembling the appearance of water in which rice has been boiled that they are always

described under the name of "rice-water stools." The pulse rises in frequency and quickly loses its force, dying away until it becomes imperceptible; faintness and sinking increase; respiration is quickened, becoming shallow and difficult; the voice is feeble, hoarse, and characteristic; cramps add to the misery of the scene. I have never seen this painful symptom so severe as it is described by Jameson and others who saw the disease in 1817. When present this symptom, while it adds to the patient's discomfort, is not *per se*, at least where not excessive, an unfavourable sign; certainly in innumerable cases of the most fatal form of cholera that have come under my observation this symptom has been absent from first to last. When, however, cramps are severe, frequent, and long-continued, they tend rapidly to exhaust the patient and hasten the end.¹ There is now great restlessness, extreme prostration, a ghastly expression of countenance, with hollow, sunken eyes with dark circles; the body is cold, more or less bluish, and cold sweats appear; the hands look as if they had been macerated; the breath and tongue are cold, and secretion is suspended: this is the stage of collapse, in which the patient resembles a corpse covered with a clammy sweat. Throughout, the thirst is intense, and a "burning" sensation at the

¹ While this sheet is passing through the press cholera is raging in the north of Italy, as well as at Trieste and Fiume. The Italian physicians report on "the extreme severity of the cramps in the stomach, and the extraordinary rapidity with which death ensues in the fatal cases, often only an hour or two from the first seizure." This was the experience of those who had to deal with the epidemic in Bengal in 1817.

pit of the stomach is often complained of. A thermometer in the axilla will stand at 86° or 90° F., while in the rectum it will be as high as 103° F. All this time, if a change for the better does not take place, the patient goes from bad to worse ; the voice grows weaker, the eyes sink more and more, vision becomes more indistinct, and death creeps on, life passing away almost imperceptibly. The temperature rises soon after death.

The signs of reaction are these : The rice-water stools cease, they become of a pale yellowish colour ; some bile then appears, giving them a greenish appearance ; then they take on a distinctly yellow colour, become more consistent, and finally fæcal in appearance and odour. The pulse returns and regains its force, the temperature is restored, the skin loses its cold and clammy condition, the secretion of urine, entirely suspended during the attack, is restored : this is the stage of reaction, a more or less febrile condition. The time during which urine is suppressed varies, ten or twelve hours is the average. If the period of suppression much exceeds the above it is an unfavourable symptom ; cases are on record in which it has been suspended for three days and yet the patient has recovered ; but this is foreign to my experience. Bloody stools are sometimes seen ; this was not frequent in my Indian experience, except in the case of patients attacked with cholera when suffering from, or convalescing from, acute dysentery. It appears to have occurred more frequently in the last epidemic in London ; and Dr. Sutton notes that patients who pass bloody stools seldom live more than twelve hours. The same

physician remarks, "that if a patient remains for a long time pulseless, with a natural colour, a greasy perspiring skin, with a wet face and hair, he will generally pass bloody stools and die."

I have seen in intemperate Europeans in India many cases that have entered hopefully on the stage of reaction attacked by vomiting of green paint-looking matter, doubtless bile acted upon by acid secreted by the stomach. I regard this as a symptom of evil omen, and once this condition is fairly established it is almost impossible to control it. I call to mind the case of an officer, a free liver, who survived the algide stage for seventeen days, and finally succumbed to an attack of this kind which lasted for many days.

In some cases patients struggle through both the algide and reaction stages only to sink into a low typhoid condition; others perish with symptoms of uræmic poisoning when suppression of urine is long continued: this is one of the penalties of long-continued intemperance, resulting in degeneration of the kidneys.

In weakly Asiatics sloughing of the cornea is not an uncommon occurrence.

To what is the algide stage of cholera due? Dr. George Johnson accounts for it on the hypothesis that the "cholera poison" in the blood, in addition to being the cause of the cramps, excites contraction of the muscular walls of the pulmonary arteries, thus arresting the flow of blood into the lungs; the empty condition of the lung capillaries and loss of weight of the lungs (first pointed out by Parkes), he deems proof of this

theory; now the liver, spleen, and kidneys have lost weight also. If this theory was put forward by itself we might say of it that it was an ingenious hypothesis and pass on. But on it is based a system of treatment which, in the opinion of the best authorities on tropical medicine, is in a high degree dangerous. This part of the theory is not new; many of the old Indian practitioners acted upon it, and purged their patients in the hope of expelling the "cholera poison." A survival of this school I knew in the Deccan, who, without ever having heard of the action of this poison on the muscular walls of the pulmonary arteries, lived and died under the conviction that purgation was the road to safety, and conscientiously acting on this conviction, earned for himself, among the Mussulman troopers committed to his care, the *sobriquet* of Azrael, the Angel of Death!

Cramps, as I have told you, are often absent in the most fatal forms of cholera, when the poison, whatever it be, ought, according to this hypothesis, to be most active. Again, the author of this theory holds that it finds support from the fact that men who have hardly purged at all die of cholera. Open the bodies of such men and you will find, the small intestines particularly, gorged with the rice-water dejections of the disease. Then, in a cholera epidemic, cases are constantly brought to hospitals and dispensaries who have passed through the stage of purging before they are seen. This is a matter of notoriety in every Indian hospital, and it was noticed by Annesley more than half a century ago.

But the argument most fatal to this theory is that if we can arrest the first sign of the disease, the diarrhoea, in the vast majority of cases, we save the patient. Mr. Macnamara, a distinguished pupil of the author of this theory, went to India strongly imbued with it, but soon learned in the school of experience that its ingenuity was its only recommendation. Believe me, gentlemen, cholera can purge and kill without the well-meant assistance of the physician.

Morbid Anatomy—the Blood.—The researches of Schmidt, Dorpat, Robertson of Edinburgh, the late Professor Parkes, and Dr. Garrod, show “that important changes in the chemical constitution of the blood take place, and that these changes lead to the loss of temperature, the embarrassed breathing, and finally, the arrest of the circulation.” They note that both the voluntary and involuntary mechanical arts of breathing are not materially affected, and that the heart acts until no more blood is supplied to its left cavities.

Schmidt has investigated the steps which attend the transudation from the blood of the serum and fibrin into the intestinal canal, and has shown the order in which this takes place. “The water goes before the solids of the serum, and the inorganic before the organic solids. Chlorides go before the phosphates; the salts of soda before the salts of potash. The blood is left with an excess of albumen and of blood-cells.” Parkes, calling to mind the great share taken by the blood-globules in the respiratory and heat-producing processes,

concludes "that their loss of salts is connected with the characteristic cyanosis and lowered temperature in cholera."

The bodies of those dead of cholera resist decomposition longer than others, a fact attributed to the loss of water. The rise in temperature after death has already been noticed, and nervous twitchings are common.

Heart is unchanged; if any blood is found in its cavities it will be on the right side.

Lungs are lighter, in other respects no alteration of structure.

Intestines invariably packed into a small space. The small intestines contain more or less of the rice-water stools, with epithelium.

Spleen small and shrunken.

Liver usually contains little blood, and weighs less than normal.

Bladder empty.

Kidneys.—The changes noted by some observers, particularly Lebert at Zurich, viz. enlargement from congestion, both of cortical and medullary substances, are certainly not common, and when found are probably due to other causes, particularly intemperate habits.

Treatment.—What I said of yellow fever I have to repeat of cholera; although a specific disease there is no specific treatment for it.

Premonitory Diarrhœa.—I have already said if you can arrest the premonitory diarrhœa, you save the patient;

hence the vast importance of early treatment. When you have to deal with bodies of men, large or small, no pains should be spared to bring those affected with this symptom under early treatment; nothing but frequent inspection will accomplish this. An experienced medical officer, or in India a well-trained medical subordinate familiar with the disease, should see every man in the regiment and every man on guard or other duty three times a day; availing himself of the various parades, roll-calls, or any other cause which assembles the men, he will go down the ranks attentively observing their faces. If a man has had several, or even one large choleraic stool, he will carry the trace of it in his face. It is difficult to describe it in words; once seen, it is easy to recognise the "drawn," somewhat pale, slightly anxious countenance, with, it may be, a slightly sunken condition of the eyes. Mark that man well. You will soon notice by his gait that already he is weak, and that if left to himself he would gladly lie down. At once let all who exhibit, in however small a degree, such symptoms be brought under treatment. Place him in the recumbent position, and administer a stimulating draught with opium. Most medical men have a favourite formula. Some give half or a full glass of brandy in hot water, with 20 or 30 drops of Tinct. opii, or a smaller quantity of the liquor opii sedativ.; and it is also advisable to apply a large sinapism to the abdomen, and warmth to the feet. If the diarrhoea is not at once checked by this, 5 or 10 drops may be given of the mixture against diarrhoea in the *Medical Field Companion*, with the

addition of a few drops of diluted sulphuric acid ; or this mixture in a full dose with the above addition of opium may be given from the first.¹ It is at this, the early stage, that opium, used in a rational manner, is useful. It has no place in the treatment of cholera when once the patient has entered on the stage of collapse. The reason is obvious : when taken during collapse it is either at once vomited or retained ; in the first case it is useless, in the second all experience proves it is hurtful. As the patient struggles out of the algide stage into that of reaction the system is embarrassed by the presence of opium in the stomach which interferes with nutrition, delays the secretion of urine, and thus increases the risk of fatal head symptoms from uræmic poisoning.

The treatment of the stage of collapse resolves itself into abstention from useless or mischievous medication, and good nursing ; the patient should have as much iced water to drink as he pleases, more than this, if sluggish, it should be pressed on him. To withhold water is an act of useless cruelty. On the plea that it increased vomiting it was long withheld. It was once my ill fortune to have an attack of cholera. I directed a confidential servant to give me well-cooled soda-water to drink as long as I could swallow it. This he did, and

¹ Some prefer what is known as Graves' Pill, viz. 4 grains of acetate of lead, with 1 of opium. This is very handy on the line of march, and can be given, if necessary, to the extent of three pills at a proper interval, followed by the mixture in the text, the *formula* for which will be found in the Appendix.

I partook of it freely. I vomited much and often ; but I well remember how it refreshed me, also that I observed with satisfaction the energy with which the act of vomiting was performed, even projecting what I had taken through an open door near my bed into the next room, which I justly regarded as a proof of viability—very comforting. Is the application of external heat of any avail? I do not think so. It was naturally the first thing thought of when European physicians had to treat the disease in India ; it has long been given up there as a useless annoyance. When cholera reached England, the most elaborate preparations for the application of external heat were made, and complete sets of hollow tin armour, adapted to fit every part of the person, are to be seen as relics of a past superstition in cholera hospitals at home to this day. Such appliances are not only useless but hateful to all patients ; and I take it we must look for the explanation to the high temperature of the interior of the body. Asiatics are peculiarly impatient of blanketing.

You will ask me, “ Can we do nothing in this stage? ” Are stimulants of no use in this condition of collapse? Like the application of heat this was one of the first remedies thought of ; it is the first to which an inexperienced man flies. The time for stimulants is, as I have already said, at the first onset of the disease in the stage of premonitory diarrhoea. Like opium or any other remedy, it is either rejected or retained ; if the first it is of course useless, if the second it is hurtful, as the collapse passes away. I affirm that the

presence of brandy is a hindrance not a help to the system, and if in excess is a positive danger, delaying the secretion of urine, increasing the febrile condition, and either directly promoting or increasing cerebral mischief.

And here, gentlemen, let me say, once and for all, that remedies administered in the stage of collapse are futile; they cannot, in the existing state of the system, be assimilated, even if retained, and are better left in their proper place—the dispensary: this was not the opinion of a large number of practitioners in the year 1865-66, when cholera was epidemic in this country. The public were stunned by the number of “remedies” clamorously announced, not in the medical press only but in the newspapers. Those “remedies” were usually composed of the most active drugs in the pharmacopœia, and of the most opposite action on the system. It seemed as if the opinion was that every one attacked by cholera must die, unless drugged with something; and if recovery took place it was credited to the “remedy,” whatever it was, and under the heading of a “Cure for Cholera” the event was duly announced in the newspapers. Some of the remedies had an element of the ridiculous; one in particular I remember, of which it is hard to say whether absurdity or mischievousness predominated in its conception. An ingenious gentleman contrived an apparatus for mechanically preventing the escape from the body of the cholera excretions already in the intestine, in the belief that he could in this manner save his patient, and in

perfect good faith published his plan as a "Cure for Cholera."

Some of the "remedies" were too serious for a joke. An army surgeon put forth a statement that in strychnia he had found a remedy for cholera that seldom failed. So confidently was this statement made that a circular was issued by authority to the medical officers of the army, then contending with an epidemic of cholera at Malta, advising a trial of it. The dose of strychnia recommended was distinctly dangerous, so much so that I published in the Army Medical Department Report for that year an earnest caution against its use. I have the authority of the then principal medical officer at Malta for saying that not only was the "remedy" useless, but that all those to whom it was given in the manner objected to, who survived to enter on the stage of reaction, exhibited unequivocal symptoms of its poisonous action.

I hope and believe that we have seen the last of these "leaps in the dark;" still, I deem it my duty to give you this word of caution, when you hear the cry, Lo! here is a remedy for the collapse of cholera; exercise a wholesome scepticism, more particularly if the new remedy is of the nature of an active poison; cholera, believe me, can wage successful war against the human race without the aid of any such alliance.

Nitrite of amyl has been recommended with reference to Dr. Johnson's theory; on that theory the recommendation is rational. I have never seen it used, nor have I met with any trustworthy records of its use.

Calabar bean has been used on account of its power of expanding the peripheral blood-vessels, in other words, on the same grounds on which nitrite of amyl has been suggested, that is, based on Dr. Johnson's theory. I have used this remedy in tetanus with success; I have no experience of it in cholera. I cannot conceive that in the algide stage it can be absorbed, and am sure that in that of reaction it is not required.

All this you will say is purely negative; is there nothing to be said on the positive side? Well, my first duty is to show you "how not to do it," or rather attempt to do it. Undoubtedly much can be done to aid the system struggling out of the algide stage into that of reaction, and conducting the patient safely through that stage, which is not without its dangers. In this way many lives may be saved.

I have already advised that the patient should have water given him *ad libitum*, plain or ærated as he desires, in either case iced; not given in large draughts, but little and often—or he may suck ice from first to last. If the vomiting is excessive, and more particularly if it is prolonged into the stage of reaction, the epigastric region may be covered with a large sinapism, or a cloth wrung out of hot water, and sprinkled with turpentine may be used; or the stimulating application may be applied in the course of the pneumogastric nerve. Cramps are best met by a few whiffs of chloroform, by the same remedy locally applied, and by friction. When the first signs of reaction appear the patient should be wiped dry; if his linen is damp and soiled, it should be changed without

taking him out of the horizontal posture, which is in a high degree dangerous.

Now should begin the assiduous nutrition of the patient. I have tried a great variety of articles of diet for this purpose, and have found that for the first few hours nothing answers so well in the majority of cases as thin water arrowroot, given in small quantities, almost spoonful by spoonful, so as not to provoke vomiting; enemata of beef-tea should be given every four hours, with a little brandy; iced milk is much relished, and white wine whey can be given from time to time; chicken-tea, then stronger beef-tea, as the stomach can bear it. To restore the secretion of urine is a point of paramount importance; dry cupping and fomentations and stupes over the loins are useful; and Macnamara advises ten drops of the tincture of cantharides in water every hour until a drachm has been taken. Should vomiting recur, more particularly the green bilious matter of which I have spoken, some Indian practitioners advise calomel in full doses. Macnamara gives his high authority in favour of a scruple dose. My objection to so "heroic" a remedy is, first, experience has shown that in such doses a large part of the drug passes unchanged through the system, and is therefore unnecessary; secondly, because we are certain to meet in practice an uncertain number of people whose idiosyncrasy is such that mercury in such large doses is certain to produce salivation to a distressing degree, without any compensating benefit, and in some serious destruction of the tissues of the throat

and mouth.¹ Before having recourse to calomel at all try the effect of ice, of counter-irritation to the epigastrium, and in the course of the pneumogastric, and of drop doses of the liquor arsenicalis every half-hour, until a medicinal dose has been taken. In men of intemperate habits it may be necessary to give stimulants, which should be administered in beef-tea, or egg emulsion, by the rectum.

When driven by the failure of the above means to the use of calomel, give it in small doses of not more than from 2 to 3 or 4 grains. I speak from a large experience when I say that all this remedy can effect will be attained in this way without risk or the chance of serious inconvenience to the physician and something worse to the patient. Professor Botkin employed quinine in the treatment of cholera, "the result being a mortality of 17.3 per cent." Happy Professor Botkin, I congratulate him on his success, but venture to add that he was fortunate in the kind of cholera he had to deal with. And here let me remark that remedies used towards the close of an epidemic often obtain an undeserved reputation. Account for it as we may, the fact is that all the world over the disease is twice as virulent and fatal at the beginning of an epidemic as towards its termination.

¹ In a case of dysentery reported by Parkes (Remarks on Dysentery), a scruple of calomel was administered without his knowledge. When the stomach was opened a whitish powder was seen to cover the places where numerous ulcerations on the mucous surface of the large curvature were found; and, he adds, "I have seen these ulcers produced by calomel in another case." So have I.

There is one paramount duty on which I must insist, and that is the right disposal of the excretions. To permit them to be so buried as to risk contamination of the water supply is nothing short of criminal. I could wish, with my colleague, Professor de Chaumont, they could be destroyed by fire. They should be received in glazed vessels at once, strongly disinfected, and then buried deeply in a safe place; the linen and bed-clothes should at once be plunged into a solution of chloride of lime, then into boiling water, then, if possible, exposed to a high temperature in a disinfecting chamber, *before* being sent in the usual way to the wash. To send cholera-soiled clothing to the laundry (or the dhobie in India) without being dealt with in this way, I say it again, is criminal.

Prevention.—This emphatically is better than cure.

In India flight is now reduced to a system as regards troops. It is not optional; the telegraph as a rule gives notice in many instances of a “body of cholera” being on the march, and along the great lines of communication its progress is reported from day to day, even from hour to hour. The regulations require that within a reasonable distance of all stations where European troops are quartered, the quartermaster-general of the division shall keep in a good sanitary condition an encamping place to which the troops can be moved as soon as the station is invaded. To this they go at once. The strictest sanitary discipline is to be observed at this camp, and if the disease clings to the regiment at the new encampment, a fresh move-

ment to another by a short and easy march is to be made.

The rule is an admirable one, and when carried out has in many instances been successful. I need not dwell on the details of this measure; they are all precisely laid down, and are part of the standing orders of every cantonment in India. In moving from place to place to escape cholera-infected spots, it is recommended to march at right angles to the prevailing wind. Avoid pitching on the banks of rivers; if a river is in front cross it at once and get away from it. On the line of march it is well that trustworthy non-commissioned officers should be supplied with pills of acetate of lead and opium, 4 grains of the former to 1 of the latter; of these one may be given at once to any man attacked with diarrhoea; and if more than once purged he should be placed in one of the carriages provided for the sick. The pill can be repeated, *if* necessary, once or twice.

Avoid communication with an infected body of men, and above all encamping on ground suspected to have been occupied by travellers from infected places. Spare no pains to secure the best water, and to guard its source from contamination. Dispose of the dead so as not to injure the living. In camp coffins are not available, but whatever the ceremonies be, the body should be deeply buried and secured against exhumation by unclean beasts of prey. In this way I have known the disease to have been spread.

I have said nothing on the subject of Dr. Chapman's neuro-dynamic treatment of cholera, not because it is

based on a hypothesis ; I am not a scorner of theories. I agree with Sir Andrew Clark "that even a false theory has its uses, and, instead of hindering, hastens the advance of knowledge ;" and "that when men of science disclaim hypotheses, they are either unfit for their vocation, or, like Newton, they are better than their creed." Dr. Chapman's treatment consists in the use of the ice-bag to the spine. There is evidence to show that this method does sometimes control the vomiting and soothes the patient. Once more I say, when we consider the high internal temperature, even during the collapse of cholera, we can to some extent understand this. Very recently I saw a case of obstinate vomiting in the person of a non-pregnant lady, which had resisted the usual remedies very carefully applied by an able physician. The lady, of her own accord, applied ice to the throat and neck ; the vomiting ceased. Was this due to the sedative effect of the ice on the pneumogastric nerve? Probably.

What I say in reference to Dr. Chapman's conscientious belief that the ice-bag offers a cure for cholera is this: Every one to whom it was applied did not die. Numbers of cholera patients do not die, even if they have no treatment but cold water ; and at least a half of the cases even in a bad epidemic recover under various forms of treatment. Until evidence be forthcoming that a large number of cases, not at the end but the beginning of an epidemic, yield to the ice-bag, I must maintain that a "cure for cholera" is yet in the future.

LECTURE XIV

DISEASES OF THE LIVER

Acute Congestion

IN this course I confine myself to the affections of the liver, which, if not quite peculiar to hot climates, are most common to them, viz. acute congestion and suppurative inflammation, or, as Murchison preferred to call it, "tropical abscess."

Within easy reach you have in the great work of Frerichs, and those of Budd and Murchison, complete treatises on diseases of the liver. All these eminent men now rest from their labours, but I do not think that what they have written has, on any very material point, become obsolete.

India and "liver" have become inseparably associated in the popular mind. Every "old Indian" is supposed to have left half of that organ behind him, or to have brought home with him a development of it unknown in temperate climates. Yet, as Morehead pointed out, if we take a large view, it will be found that this organ suffers rather more from disease in Europe than in India. The two affections named above are those most commonly

seen there, and one of them, namely, tropical abscess, is one of the most serious diseases with which you will have to deal in your future career, and therefore demands most careful consideration here.

There is one term I have often wished struck out of our nomenclature, viz. hepatitis, acute and chronic. In past years the term was used to cloak careless diagnosis. I have known enlargements due to malarial fevers, lardaceous and fatty degeneration, hydatid tumour, and even malignant disease sent home as chronic hepatitis. I have for years past in my lectures here dwelt on this point; I do not know whether or not I can take credit for the fact, but a fact it is, mistakes of this kind have become rare, "small by degrees and beautifully less," until I may say they have ceased.

If you aspire, as I hope you all do, to accuracy in the diagnosis of hepatic disease, you must make yourselves masters of what the late Dr. Sibson called the "medical anatomy" of the organ. Without having always in your mind's eye the most intimate recollection of its size, limits in every direction, and relation to other organs in health, and its size and abnormal forms in disease, you will be constantly led into the gravest errors. Do not suppose that this knowledge is of easy acquirement. On this subject Frerichs remarks, "This is a less simple matter than might at first sight appear; manifold difficulties, which may lead to mistakes, meet us at every step." This author in his great work devotes several chapters to the relative size and weight of the liver in health and in disease, and to the diagnostic value of its abnormal sizes and forms.

“The surface of the liver,” he goes on in the same passage to say, “which is in contact with the wall of the chest and abdomen, is the part of the organ upon the size of which we must depend for information. The extent of this surface, however, is very variable, even when there is no alteration in the volume of the liver, inasmuch as the position of the organ is liable to change. Extension in a downward direction, such as results from the pressure of tight clothing, from deformity of the lower part of the chest, and softening of the hepatic parenchyma, brings a larger portion of the surface into contact with the abdominal wall, and so produces an apparent enlargement; whilst, on the other hand, elevation of the organ, and the change in position produced by distension of the lower part of the abdomen, bring the anterior sharp margin of the organ in opposition to the abdominal wall, and thus give rise to an apparent diminution. These conditions, as well as congenital and acquired malformations of the liver, constitute our first difficulties in diagnosis; others arise from displacement of the entire organ, and from the obstacles which are experienced in determining its boundaries, owing to pathological changes in the adjoining parts.”

There are four regions which must be carefully examined by palpation and by percussion when we wish to map out the limits of the liver, viz. the median, the mammary, the axillary, and the dorsal lines, carrying the examination in every case below the false ribs.

Briefly, then, the liver occupies the right hypochondrium, the left lobe projecting into the epigastrium, where

it is uncovered by the arch of the ribs which conceals the right lobe ; the convex surface fits into the concave base of the right lung, the diaphragm being interposed ; it projects into the thorax, the thin lower margin of the right lung separating its upper portion from the walls of the chest—at this point the pulmonary note is distinct. The liver from the point where the ensiform cartilage joins the sternum, is directed towards the vertebral column in a direction backwards and slightly downwards ; its under surface is in close relation with the stomach, the large intestine, and the right kidney. The right mammary line descends perpendicularly from the right nipple ; in this line we find the upper margin of the liver in the fifth intercostal space, where, as already said, the lower margin of the lung overlaps it. The right axillary line falls perpendicularly from the centre of the axilla ; in this line its upper margin is in the seventh intercostal space. The dorsal line falls perpendicularly from the lower angle of the scapula ; in this line the upper margin is in the ninth intercostal space. In the right mammary line the extent of dulness is 4 inches, in the axillary line between 4 and 5 inches, in the dorsal line 4 inches, and between 3 and 4 inches in the median line anteriorly (*vide Sibson's Medical Anatomy*).

By the term acute congestion of the liver, you are to understand active arterial congestion, not the passive congestion seen in cardiac disease, or the enlargement of malarial fevers. To what is this acute congestion due? Among Europeans in India, Englishmen more particularly, two causes are actively engaged in predisposing to this

condition, viz. the inordinate use of animal food, and indulgence in alcoholic drinks.

Our countrymen carry to the East their flesh-eating propensities, and, as a rule, are slow to understand that the habit of consuming animal food two or three times a day is in the long run incompatible with health. Meat to breakfast, luncheon, and dinner is more than the systems of most people in average health can turn to good account in their native land, unless their habits of life are somewhat akin to those of navvies. This practice carried to the East, as it is by hundreds of our countrymen and women, has always been a fertile source of hepatic disease, more particularly when any considerable portion of this food is consumed in the shape of hotly-spiced and rich curries. I am informed that in the present day curries have gone out of fashion among the upper classes of Englishmen, but our European soldiers use them as much as ever. Curries no doubt enter largely into the food of rich natives, but for the most part they are vegetable curries, used as a corrective to the flatulence induced by the great bulk of the vegetable element which constitutes the greatest, and, in some castes, the sole element of their diet, ghee (clarified butter) excepted. The amount of animal food entering into the ration of the English soldier at home is scanty enough. It is different in India; there meat is cheaper, and the pay of the soldier enables him to make a considerable addition to his daily allowance. I have just been reading a very clever and faithful record of life in India by the wife of a civilian. I quote from her diary the *menu* of an Indian

breakfast as it is in the present day. "The orthodox Indian one" is thus described: "The latter (breakfast), as given in ninety-nine houses in a hundred, is merely a mis-timed *dinner*, differing in hardly any respect from dinner except in not beginning with soup. You sit down to a blank table covered only with flowers, and the servants hand round course after course—fish, curry, cutlets, aspic, game—winding up by placing finger-bowls and dessert on the table!" To the above add a meat luncheon, and, I need not add, a heavy meat dinner. Of course all do not eat in this way, but many do, and blame the "climate" for the consequences.

With regard to over-indulgence in alcoholic drinks, it is with pleasure I say it, the improvement in this particular in the habits of the educated European classes is greater even than at home. Time was when it was far otherwise. In regimental messes, within my own recollection, not to press wine or beer or spirits on guests, to the verge of intoxication, was regarded as almost a breach of hospitality; the two former during, the latter after dinner. I have often seen palankeen bearers in waiting quietly smoking their "hubble-bubble" pipes, ready to carry home the "killed and wounded" from the mess-table on "guest nights." Even before I left India scenes of this kind were "more honoured in the breach than the observance," and excess is now as rare at a mess-table as in the society of ladies, no more to be seen among officers and gentlemen than the "pig-tails" of which a wit long ago sung that they are "now cut off." There is, however, a practice, not unknown, I am sorry to say, at

home, which prevails among young men, which I unhesitatingly stigmatise as in a high degree pernicious; I mean what is known as "peg-drinking." The "peg" with grim pleasantry refers to a nail in the coffin—"tap, tap, says the hammer to the nail on the coffin-lid." The spirit in the peg is by many thoughtless ones supposed to be rendered quite innocuous because it pleasantly effervesces in soda-water.

Gentlemen, I ask you by precept and by example to set your faces against a practice which has been the first step to ruin in innumerable examples, not of health only, but of all that makes life worth living.

I am glad to say, as I have already said in my introductory lecture, that this improvement is not confined to commissioned officers and to those in the upper classes, but has largely extended to non-commissioned officers and soldiers, and with all the earnestness of which I am capable I ask you to do all in your power to promote the temperance movement in India. Excess, then, in the use of nitrogenous food, and the abuse of alcoholic drinks has been in the past, and to some extent still is, a predisposing cause of acute congestion of the liver, more particularly among those who lead indolent lives.

I have already called your attention to the evidence in the shape of the prevalence of more or less scurvy in the ranks of European regiments in India in proof that a sufficiency of the vegetable element does not enter into the diet of the soldier. An attempt, as you all know, was made some years ago to cloak the failure of an Arctic expedition from scurvy by attempting to prove that it was not due to deprivation, against not medical

advice only, but dear-bought experience, of the vegetable element in the diet of the seamen. The attempt conspicuously failed. As if to emphasise that well-deserved failure, we have the record of the Swedish Arctic Expedition under Nordenskiöld, a triumphant vindication of what a diet based on sound scientific principles can do to maintain health under the most trying circumstances. Into this diet the vegetable element entered largely, and the result, it is to be hoped, will for ever silence the stupid attempts to undervalue it as an article of diet.

Some degree of congestion of the liver attends every meal, and the larger and richer the meal the more marked is the congestion. Those who habitually exceed in this way in hot climates, and at the same time neglect the regulation of their bowels are the most prone to suffer from acute congestion.

The most frequent exciting cause of this condition is exposure to a sudden change of temperature after being heated by exertion, as after such games as rackets or tennis; when engaged in without the observance of the common precautions which experience proves to be needful even in temperate climates. In the one case an attack of catarrh or pleurisy, or rheumatism, in the other acute congestion, sometimes going on to suppuration of the liver, are the consequences of exposing the body to a chill from a current of relatively cold air, when perspiring freely. Protection after such exertion by loose light flannel clothing is as necessary in India as it is at home. I call to mind some striking examples not only of acute congestion of the liver

brought on in this way, but of fatal suppurative inflammation. Martin long ago pointed out the frequency of such an occurrence in Calcutta in men and women coming out into the cold wind of the early morning after dancing.

Acute congestion is not difficult of recognition. Its symptoms are uniform and smooth enlargement of the liver in all directions, with a sense of fulness always amounting to uneasiness, sometimes to pain; with, if the enlargement is considerable, hurried breathing, dorsal decubitus, aggravated if the patient is made to assume a position on his left side; yellowness of the eyes, a muddy complexion, sometimes jaundice, nausea, and constipation of the bowels. Some elevation of temperature, *malaise*, and general discomfort.

Treatment.—This is simple, and generally effective. The application of leeches to the side or to the verge of the anus is very seldom required. The latter is an operation much disliked by patients, and the bleeding is sometimes troublesome to arrest. Free purgation, with the application of a turpentine stupe, low diet, and the use for some days of some of the bitter German waters when available—the Friedrichsall, Hunyadi Janos, or Pulna waters—suffices. Here let me give you a word of caution as to the use of saline purgatives when cholera is about. Every practitioner in Calcutta is aware of the danger. Seamen who have been dissipating on shore return to their ships feverish and uncomfortable, and apply to their captains for a “dose of salts,” which is usually given, being a cheap remedy, with a liberal

hand, largely diluted; the effect being first profuse watery diarrhoea going on into rice-water stools, cholera, and death. I call to mind a melancholy example. A young engineer officer, fresh from Addiscombe, was my fellow-passenger in a P. & O. steamer which I joined at Madras for Calcutta; this young man, without advice, took a large dose of Epsom Salts in the manner described, a few days after landing, was violently purged, and died in the collapse of cholera in a few hours. The disease was not prevalent at the time. Chevers, I think, noticed this long ago. The fact is notorious, and I have seen the same thing among seamen brought to the Madras General Hospital from some of the punch-houses where they have been living while on shore.

Patients should be cautioned to alter their habits of life and to accommodate themselves to their novel conditions, and told that after having suffered several times, they will be more prone to fresh attacks from slight causes; above all, that acute congestion may be the first stage on the road to suppuration, the most formidable disease to which the liver is liable. By men with a tendency to congestion of the liver, animal food should be most sparingly used; and if alcoholic liquors are used at all, they should be of the lightest and consumed only in moderation. I have sometimes been asked why we do not see many cases of cirrhosis of the liver and its sequels in the medical wards of this hospital; the reason is not far to seek, drunkards in India find shorter roads to their graves.

Suppurative Inflammation of the Liver.

This is a rare disease in temperate climates ; when seen the abscess can be traced to inflammation, the result of direct injury, such as a blow in the right hypochondrium, or to pyæmia, from suppuration of bone, ulceration of the intestines, the stomach, the gall-bladder, or gall-ducts. Abscesses may form around foreign bodies lodged in the liver, such as needles, as in the example I show you, where there is a cavity in the right lobe, with a needle two and a half inches long lodged in it. This was taken from the body of a man who died of phthisis. The man had swallowed the needle two years before death ; the pus had drained away through a small opening into the duodenum immediately below the pyloric orifice of the stomach. Here is a remarkable specimen showing the liver perforated in every direction by lumbrici, around which small abscesses had formed. The gall-bladder and biliary ducts are, as you observe, filled with these filthy intruders ; some were found in the stomach and duodenum, in the nares and frontal sinuses. The specimen was taken from the body of a Maltese boy, who died of dysentery.

I have only seen one example of abscess of the liver following a blow. A soldier of intemperate habits, while intoxicated, was run away with by a pony, his right side coming into violent contact with a gate post ; an enormous abscess followed which proved fatal. Examples of pyæmic abscesses of the liver following

suppuration in distant parts of the body are not uncommon in hospitals at home. Dance, Cruveilhier, Jackson of Calcutta, and other authors record cases of abscess of the liver following such operations as cauterisation of a rectal cancer, fistula in ano, the extirpation of hæmorrhoids, and roughness in reducing prolapsus of the rectum; the abscesses from such causes result from suppurative inflammation of the hæmorrhoidal veins, and are always multiple.

I saw some years since an example of hepatic abscess following long-continued suppuration near the anus; I have every reason to believe it was single. The man was a miller who had never been out of Hampshire. Unlike the multiple abscesses arising from one or other of the above causes, this one presented a well-defined fluctuating tumour; it was relieved by aspiration, and did not recur.

To the frequent occurrence of liver abscess in tropical dysentery I have already called your attention in my lessons on that disease. The late Dr. George Budd, who for many years was one of the physicians to the Dreadnought Seamen's Hospital in the Thames, believed that all, or nearly all, abscesses of the liver could be traced to contamination of the portal blood, either by pus, formed by suppurative inflammation of one of the small intestinal veins, or by matter of other kind resulting from softening of the tissues; or by the fœtid gaseous and liquid contents of the large intestine in dysentery, absorbed and conveyed immediately to the liver. That this pyæmic theory accounts for the multiple

abscesses found as a sequel or accompaniment of tropical dysentery is probably quite true, but the following facts published by me in 1871 in Russell Reynolds' *System of Medicine* (article, "Suppurative Inflammation of the Liver," vol. iii.) proves that this theory of Budd's is too exclusive. In the pathological collection here there are 48 specimens of abscess of the liver, most of them are on the table before you; in 34 of the cases there was no intestinal lesion; in 9 there was a dysenteric history, but no trace of intestinal lesion *post-mortem*; in 5 hepatic abscess and intestinal lesion coexisted. In 50 of Morehead's fatal cases of dysentery there was no hepatic abscess, and in 21 of his fatal cases of abscess there was no ulceration of the intestines. Parkes found liver abscess in 21.74 per cent of his fatal cases of dysentery. Waring gives the percentage of liver abscess in dysentery at 26.15; the same author gives 27 per cent as the proportion of cases of liver abscess preceded by dysentery. The above is proof sufficient that Budd's theory is too exclusive.

Suppurative inflammation of the liver is a disease of hot and malarious countries, but is not equally prevalent in all. Thus it is a common and fatal disease in India, while in the West Indies it is rare and the mortality from it small. In both countries the temperature is high, and as regards the use and abuse of alcohol, the habits of our countrymen are much the same. The planters, in the palmy days of West Indian prosperity, to any other virtues they possessed did not add that of temperance; the same is true as regards soldiers serv-

ing there; new rum was abundant, and was abundantly used. The difference in diet in past days was considerable. Animal food was dearer in the West than in the East, and for a long time, for this reason, salt meat entered largely into the soldier's ration, a fact which in such a climate led to a smaller consumption than in India. The insular climate no doubt exercised a salutary influence; although the temperature in the West India islands is usually high during the day, it is not so continuous as in India, and the nights are cooler. Moreover, the air is tempered and purified by the regular action of the sea-breeze in a manner quite unknown in India, save in the parts of that great continent near the sea. In the West Indies Europeans expose themselves to the sun with comparative impunity. English soldiers in past days undergoing penal discipline were made to labour in the quarries and on the roads, and yet did not suffer. In India this would be impossible. Excluding dysentery, the causes of suppurative inflammation of the liver are the same as those which give rise to acute congestion, viz. excess of nitrogenous food, intemperance, sudden changes of temperature acting on systems depraved by the cachexia induced by residence in a hot and malarial climate. Indolence and excess in eating, combined with heat and malaria, are probably the most active causes of the disease amongst men and women in the higher classes not given to intemperance in drinking.

According to Waring's invaluable statistical inquiry into the pathology of abscess of the liver, out of 40

cases in which the habits of the sufferers were noted, 67.5 per cent were intemperate.

Morbid Anatomy.—There is first a stage of hyperæmia, circumscribed or diffuse, according to the extent of tissue implicated; when cut, blood flows freely, and the cut surface has a granular appearance. It is only on rare occasions we have the opportunity of seeing the liver at this stage. Bounding this hyperæmic part, a buff-coloured ring of uncertain size is observed, sometimes involving a large part of the affected lobe; then lymph is effused into the congested portion, which assumes a pale colour; when cut into, pus spots will be seen thickly distributed through the section—these pus spots rapidly coalesce and form an abscess. In a liver containing multiple abscesses their formation will be seen in all the different stages.

Abscesses vary infinitely in number. In Waring's collected cases the number varied from 1 to 36. Parkes in one case counted 90. In the collection on the tables before you, 37 are single and 11 multiple. You observe how they vary in position—some are superficial, others deep-seated, circumscribed or diffuse, encysted, or limited by an ill-defined and incomplete lymph deposit; a few are enclosed in cysts of varying thickness. Here is an example where the cyst is almost cartilaginous, and in this jar I show you an inverted one which is as thick as wash-leather; the significance of this you will see presently. These cysts are obviously formed by the consolidation and organisation of the effused lymph. You observe that some of the interior

walls of the abscess are rugged, others are smooth; the first were of recent formation when thus preserved, the others were of older standing.

Note the varied positions of the abscesses in the preparations before you; in 36 cases the abscess is on the convex and upper and outer part of the right lobe, on its concave surface in 3—the left lobe is affected in 7 cases—in 1 the abscess is intermediate, and both lobes are affected in 5.

The quantity of pus will of course vary according to the size and number of the abscesses. Here is a preparation in which you observe the whole organ is converted into a great bag which contained 17 pints of pus, and 2 of thin serous fluid floating above it.

The quality of pus in a hepatic abscess varies; usually it is as the old surgeons used to say, "laudable," that is of the colour, consistence, and slight odour of a so-called healthy abscess; sometimes it has a red or pinkish colour, derived from blood more or less incorporated with it: this red colour it always gets if discharged through the lung. If air obtains access to the cavity of a liver abscess, as after surgical operations, it quickly loses its laudable character, and becomes offensive.

Modes of Discharge.—Abscesses may remain intact until death, or may find issue: (1) Externally through the abdominal walls; (2) through the diaphragm into the right lung or pleura; (3) into the pericardium; (4) into the stomach; (5) into the duodenum or colon; (6) into the abdominal cavity; (7) into a pouch of

peritoneum; (8) into the hepatic vein. In the preparations before you 29 remained intact at death, some tending towards the outer walls, others to the diaphragm; 2 were discharged by operation; 6 opened into the right lung; 3 into the cavity of the chest; 3 into the pericardium; 2 into the stomach; 1 into the duodenum; 1 into the colon, and 1 into a pouch of peritoneum.

Is an abscess of the liver ever absorbed? On the table are a number of portions of liver with puckered cicatricial depressions. In India I have sometimes seen examples presenting appearances of this kind, and in common with others have deemed them the cicatrices of small abscesses that have been absorbed; they are now recognised as of syphilitic origin, particularly when they contain gummatose nodules, with palpable evidence in other organs of constitutional syphilis.

Morehead, however, gives 3 cases in which the process of absorption had certainly taken place, and another in which it was probable. In the cases where absorption had evidently occurred, a "putty-like substance" alone remained in the cavity, identical, I presume, with the "cheesy matter" described as found by Frerichs in similar cavities in process of closing.

In the article on "Acute Hepatitis," written by me for Russell Reynolds' *System of Medicine*, I made the following observations, and I see no reason to alter the opinion there expressed. There is no disease so difficult to describe as suppurative inflammation of the liver, and paradoxical as the saying may be, I suspect this difficulty is experienced most by those who have most experience

in dealing with it. There is a disease which resembles it so closely in many of its symptoms, and which is sometimes confounded with it, that I must advert to it here—I mean inflammation of the investing capsule, the *perihepatitis* of Frerichs and other writers.

Much of the support still given to blood-letting in suppurative inflammation of the liver is based on the apparent success that follows the large abstraction of blood, in preventing, as is imagined, the formation of abscess, whereas, in a certain number of cases, the measure has been directed against this disease, which has no tendency to suppuration but rather to adhesion.

Perihepatitis is met with under two forms, or rather under two different conditions: first, as an idiopathic disease, and secondly, consecutive to abscess of the parenchyma. In the first case the symptoms resemble those of pleurisy much more than those of inflammation of the parenchyma; the pain is sharper, more acute and “stabbing” than in suppurative inflammation of the gland; it is much increased on a full inspiration, and is like what patients call “a stitch in the side”; there is no enlargement of the gland in any direction, the urine is not high-coloured, but there may be some febrile excitement with of course a rise in temperature. The above symptoms set in somewhat suddenly, after exposure to chill, or, as I have seen, from permitting wet clothes to dry on the person in a cold wind. The result is sometimes exudation of lymph between the capsule and the gland, with adhesion, and sometimes a thin layer of purulent matter. In the case of a man

from India who died at Netley from aneurism of the thoracic aorta, the liver was so closely embraced by its adherent capsule as to cause atrophy of the whole organ. This man had a history of "hepatitis," and had doubtless been treated for inflammation of the parenchyma.

The second form of perihepatitis is that which is met with when an abscess of the parenchyma involves the capsule as it makes its way to the surface. The symptoms will vary according to the position of the abscess, as we shall presently see. The important point is this: when an occurrence such as I have described takes place, a grave mistake in diagnosis may result, leading to as grave an error in treatment. Active treatment may begin on the setting in of the symptoms evidencing implication of the capsule by an advancing abscess, which is intended to *prevent* suppuration. To put it in another way, if this mistake is made, we are dealing with the last link in the chain of phenomena instead of the first. I know no point in the whole history of hepatic inflammation of so much importance as this. Let me illustrate it by two most instructive cases.

A brother officer of mine in India, of a delicate constitution, had suffered from dysentery, and occasionally passed some muco-purulent matter by stool; while visiting me one day he suddenly had a distinct rigor, with a feeling of faintness. I observed that he looked ill when he arrived, and he admitted that for some days he had been ailing, without any marked symptoms beyond loss of appetite, a feeling of *malaise*, and a dis-

inclination for physical or mental exertion. In the evening he rallied sufficiently to drive to his own quarters, some miles distant. Next day he resumed duty, experiencing now and then transient chills followed by flushes of heat. In a few days after the above he was suddenly seized with acute stabbing pain in the right hypochondrium, with sharp fever, followed by cough and sympathetic pain in the right shoulder—in a word, the symptoms usually given in text-books to describe “acute hepatitis.” Had I seen him then, I certainly would have dissuaded him from following the treatment his own judgment suggested, viz. general and local abstraction of blood, purgation, and subsequently calomel. I saw him thirty-six hours after the setting in of the above symptoms, free from pain, but much prostrated, and expectorating purulent matter, evidently from a liver abscess discharging through the right lung. The case proved fatal. On examination *post-mortem* I found an abscess on the convex surface of the liver communicating with the lung, with two other abscesses deep in the substance of the same lobe, and extensive ulceration of the great intestine.

I never entertained a doubt as to the true nature of this case. The active treatment began when it could avail nothing. The acute symptoms indicated not the beginning of inflammation in the parenchyma, but of the capsule, a conservative process glueing it to the diaphragm, and preventing extravasation of the purulent matter of an abscess antecedently and insidiously formed. It is certain that all the mischief revealed *post-mortem*

existed long before the setting in of the acute symptoms. This was clearly a case of liver abscess consecutive on dysenteric ulceration of the intestines.

Here is another case equally instructive, but with a more fortunate issue.

A young officer, who arrived at Madras from Secunderabad, in the Deccan, was placed under my care. He was twenty-four years of age, had been two years in India, and in this short time had done his best to ruin his health; he was an inveterate "peg"-drinker, kept late hours, and exposed himself recklessly to the sun. For days before I saw him he had been ailing, eating little, but drinking much, "keeping himself up" with frequent "pegs." His complexion was dark and muddy, his eyes congested, his breath alcoholic, his pulse did not much exceed 80, and he had little fever. He made no complaint of pain; his liver was enlarged, the decubitus was dorsal, but he allowed me to use great freedom in the way of palpation and percussion without complaint; his tongue was foul, his urine was high-coloured and loaded with lithates. I felt convinced that serious mischief had taken place in this young man's liver. Even had I been disposed to put antiphlogistic treatment in force, there was ample reason in his habits to forbid it: the application of even a few leeches to his side would have been followed by delirium tremens.

Short of this I did what the case admitted of, and gave orders to be called as soon as the acute symptoms, which I confidently looked for, should set in.

I was soon sent for. After a sharp rigor he had

stabbing pain in his right side, with fever, cough, a well-marked to-and-fro sound at the base of the right lung, followed soon by purulent expectoration.

My friend, Dr. Paul, of the General Hospital, saw the case with me; we were of the same mind about the treatment. We well knew that before he came under my observation an abscess was there, on the convex aspect of the liver, and that it was now in process of discharge. His strength was sustained by suitable means, and an embargo placed on his "pegs." Such pain as there was was allayed by fomentations. The mineral acids with quinine were given, and in a short time he was sent to England convalescent. There had been no dysentery, the abscess was single, and from its fortunate position it had taken the route of discharge which gives the greatest number of recoveries.

Take home the lesson this instructive case teaches. Had this young man been seen for the first time, when the acute symptoms appeared, by one ignorant of his antecedents and his habits, and had he been treated according to routine, I think the issue would have been different. Blood-letting could not have prevented the formation of an abscess—that was there already—the effect would have been probably to develop the formidable malady that dogs the footsteps of the drunkard, certainly to weaken him; if mercury had been given, and it had acted, as it is supposed to act, viz. by preventing the effusion of lymph, or causing its absorption *after* effusion, the result would have been equally unfortunate: adhesion of the opposing surfaces of the

capsule and diaphragm would have been prevented or destroyed, in either case the conservative operations of nature would have been interrupted, and escape of pus into the abdomen must have ended the case.

Symptoms.—After what I have said you will be prepared to hear that an abscess may form deep in the substance of the liver without giving rise to symptoms so marked, so easy of recognition, as you might suppose, from the descriptions given in some of our text-books. I ask you to bear in mind that the liver is not a very sensitive organ, and you cannot fail to see from the examples I have given you, that acute and, so to speak, loudly expressed pain in some cases indicates not the beginning but the end of the phenomena. One caution, however, I give you: in every case of disease that comes under your care in India, keep a watchful eye on the condition of this gland. I unhesitatingly say that the successful treatment of dysentery has largely diminished the number of cases of pyæmic abscesses following dysentery coming into this hospital from India—diminished them by more than a half. The more you are successful in dealing with dysentery in its early stages the less you will see of pyæmic multiple abscess of the liver.

A most insidious and fatal form of hepatic abscess is seen in those parts of the country where great heat and concentrated malaria are combined. During the construction of the irrigation works on the River Godavery by Sir Arthur Cotton, the late Dr. Lowe of the Madras Army was in medical charge of the great body of native labourers employed on the works. Dr. Lowe published

in the *Madras Quarterly Journal of Medicine* an interesting description of this form of suppuration of the liver under the above-mentioned combination of great heat and malaria, issuing from the alluvial soil largely disturbed by the operations of the engineer. He tells us that in numerous examples the first he saw of his patients was when they presented themselves at his hospital with hepatic abscesses fully developed. I do not say that in Europeans, except in men far advanced in malarial cachexy, you are likely to see many cases of this kind, but in Asiatics, under the conditions described, they are not uncommon.

The symptoms of acute hepatitis tending to suppuration are commonly said to be a sense of fulness and weight in the right hypochondrium, pain, inability to lie on the left side, fever, disturbance of the digestive organs, cough, sympathetic pain in the right shoulder, sometimes jaundice. Let us examine the above symptoms in their order.

(1) *Fulness and Weight in the right Hypochondrium.*—

This is more a sign of general congestion than of hepatic inflammation. It is extremely rare that so much of the liver is implicated in inflammatory action as to give rise to this symptom in a marked degree.

(2) *Pain.*—This is always influenced by the depth at which the inflammation is going on—well-marked, particularly under pressure, when that is superficial, less so or absent where it is deep-seated. It seems to be a more prominent symptom in Algeria than in India. Rouis observed it in 85 per cent of his cases.

(3) *Fever*.—You have in the clinical thermometer an advantage over those who went before you. The thermometer will give you an indication of great value where the hand will deceive. The hand is a bad index of temperature everywhere, particularly in India. It has often astonished me to see how little reliance can be placed on the pulse. This very day I carefully noted the pulse in the case of an officer in the sick officers' quarters in this hospital. This gentleman has an abscess of the liver obvious to the eye and the hand, and is to have it evacuated this day by operation, yet his pulse was only 90; during the acute stage before the formation of pus it was no doubt higher. As a rule the temperature in liver abscess rarely exceeds 103° F.; in India it would probably exceed this.

(4) Frerichs says truly that when abscess commences, "the tongue becomes covered with a gray or yellowish coat." The amount of gastric disturbance, loss of appetite, and so on, will depend upon the extent of liver tissue implicated, and above all on its situation. Vomiting when an abscess is pressing on the stomach or duodenum is hardly ever absent. Some years ago I published in the *British Medical Journal* (1st August 1873) the case of a young officer, a near relation of my own, for the particulars of which I was indebted to my friend and brother officer, Dr. Liston Paul. This young man ascended the small hill station of Rahmandroog, near Bellary; when he reached the summit he was much heated, and perspiring freely. In this state he was suddenly exposed to a strong

current of relatively cold air; the outcome was an attack of acute hepatitis. The inflammation was, to all appearance, subdued, and he was sent to Madras with a view to a sea voyage. For some days he was, on arrival there, sufficiently well to go about without inconvenience, and was about to embark; suddenly vomiting came on. Under the care of Dr. Paul every rational means was tried to arrest it without success; nutrition was impossible, and after a severe struggle he succumbed. *Post-mortem* examination revealed a small abscess not larger than an orange on the under surface of the liver, pressing on the duodenum. Had his strength held out for a few hours longer he would have been saved; a minute opening through the wall of the abscess into the bowel had already been made; in a few hours more this would have enlarged sufficiently to enable the thick pus to escape, and there would have been an end of the case. In this way I have known patients recover when death was near, even at the door. Sir Joseph Fayrer, seeing the report of this case, followed it up in the same journal with the results of his experience in like cases.

(5) *Respiration*.—This is disturbed or not according to the position of the inflammatory action; this symptom is very notable when the inflammation is on the upper and convex aspect of the gland.

(6) *Cough*.—The last observation is applicable to this symptom also; it is invariably present when the capsule is inflamed and the adhesive process between

it and the diaphragm is in progress. The "*tussa arida, sicca*," at this stage is a very old observation.

(7) *Jaundice* is a very rare symptom. Morehead's experience was to the same effect. In Algeria the French army surgeons appear to have seen it more frequently.

(8) *Urine*.—This should be closely examined; it gives most valuable information, in the exquisite forms of acute hepatitis, as witnessed in hot climates; it is highly febrile, and the pigment is greatly increased.

(Parkes).—In March 1871 Professor Parkes read a paper before the College of Physicians, "On some points connected with the elimination of nitrogen from the human body." In this paper Dr. Parkes remarked that he had examined the urine in a considerable number of cases of hepatitis and hepatic abscess; in some instances he found abundance of urine, in others scarcely any; in some it appeared to be wanting altogether. And it occurred to him "that the cause of the difference was the amount of suppuration." When this was excessive and the secreting substance of the liver was almost destroyed, the amount of urine was greatly lessened in a degree proportioned to the amount of liver substance destroyed by the abscess. On the contrary, when the liver was not suppurating, but was actively congested and enlarged, with rapidly secreting cells, the amount of urine and of uric acid seemed to be increased. When Dr. Parkes renewed his investigations on this subject at Netley, I happened to have in my wards a patient from India, from whose liver I drew

off at various times the enormous quantity of 600 ounces of purulent matter by aspiration. Dr. Parkes examined this man's urine. After every operation he rallied wonderfully, but he subsequently succumbed; in this large jar you see his liver; an immense abscess occupies the whole of the right lobe, leaving only a very narrow margin compressed by a thick cyst; the left lobe contains many abscesses of small size. The man had a distinct dysenteric history, which accounts for the multiple abscesses. This man's urine (three months and a half before his death) was collected for six days, and carefully analysed by Dr. Parkes. The daily nitrogen of his food was determined chiefly by calculation; after a liberal allowance for excess of calculation, the daily nitrogen was put at 192 grains. It was calculated that in six days he received 1152 grains of nitrogen; he passed by the urine, as determined by burning with soda-lime, during the six days 792 grains, leaving 40 per cent to be accounted for; 25 grains daily were allowed for bowel excretion, 150 grains in six days—leaves 210 grains to be accounted for. His temperature at night was 100°, 103° when the abscess was full, which ought to have increased the urea. "Considering how completely the exit covers the entrance in health, the retention of 210 grains of nitrogen in six days shows either that the growing pus cells appropriated nitrogen, or that the interruption to the proper action of the liver cells hindered the formation of urea. The latter seems more probable, because subsequently, after several operations, when the liver cells and vessels would be much

less compressed, and, therefore, for the time would be able to act, urea increased considerably, though after each operation there was no doubt a still more rapid growth of pus cells."

Referring further to the disappearance of urea in yellow atrophy of the liver, when sometimes every liver cell is smitten with a rapid atrophy or dissolution, Dr. Parkes concluded from his observations in the words of Miessoner, "that withering and destruction of the liver tissue is connected with an important diminution in the formation of urea."

It is hardly necessary, after the above, to insist on the obvious fact, that not only will a careful examination of the amount of urea eliminated by the urine, be a great aid to diagnosis in doubtful cases, but will enable the careful physician not only to form some estimate of the amount of liver tissue destroyed, and what is of more importance, will enable him to decide whether, after operation, suppuration is still going on.

In young sthenic subjects, who have not been long in the tropics, who have been living freely, exposing themselves to the sun, and to chills afterwards, you will have little difficulty in making an accurate diagnosis; the pain in the side, the impatience of palpation and sharp percussion in the hepatic region, the feverish condition and rise of temperature, the foul tongue, loss of appetite, and, generally speaking, constipated bowels, and the febrile urine, will, taken together, unequivocally point to active hepatic mischief. Again, in hot, low-lying malarial places, and particularly in the case of those whose

constitutions have been impaired by long residence in a hot climate and imprudent living, the symptoms will be more "silent" and insidious; in all, the position of the affected part, as regards nearness to the surface, or the reverse, and the extent of liver tissue implicated will exercise a marked influence on the symptoms. Once more, remember how frequently pyæmic multiple abscess of the liver follows dysentery; let the remembrance of this fact stimulate you to careful treatment of that malady, with the view to save your patient from this grave complication.

Signs of Suppuration.—These are constitutional and local. The constitutional signs will depend much upon the size and position of the abscess. If deep-seated and small, and not interfering by its pressure on other organs, these will be slight, not more perhaps than a rise in temperature of a degree or a degree and a half, with slight rigors and trifling night sweats. If, on the other hand, a considerable part of the liver tissue has suppurated, the constitutional disturbance will be well marked; the evening temperature will, as a rule, be 103° F., or a few points above; the rigors will be more distinct and the night sweats copious, with a rise in the frequency of the pulse, not, however, as I have already remarked to a high degree of frequency, unless the abscess is superficial and has involved the capsule; soon the patient begins to lose flesh, particularly if diarrhoea sets in, as it often does. If the abscess presses on the stomach or duodenum, the digestive functions will be interfered with, and sooner

or later obstinate vomiting will set in; if the abscess points upwards on the convex aspect and presses on the diaphragm, pain in that region, hurried respiration, and a dry cough will soon appear.

The local symptoms consist of swelling, more or less according to the size of the abscess, in one or other of the hepatic "lines," with fluctuation, if the pus is not very deep-seated; some œdema of the skin over the abscess is not uncommon, and aids the diagnosis.

I cannot better finish this part of the description than by giving you, as briefly as I can, the details of the case of the soldier whose urine was analysed by Dr. Parkes as already related, with a view to determine the effects of liver-cell destruction on the amount of urea in the urine.

Private T. O'K., 18th Hussars, age 31 — home service, seven months; foreign, eleven years eight months. Invalided from Secunderabad, India, at which station he served three years.

History.—Embarked for India in August 1858; had good health until February 1869, when he contracted dysentery, attributed to chill when lightly clothed on night duty; was in hospital until March of the same year, when he returned to duty. In April he had a relapse, from which he recovered in a few days. In May he was admitted with acute hepatitis, and was under treatment for a month, returning to duty to all appearance well. Before the end of June he was in hospital again with a return of his hepatic symptoms in an acute form, and was under treatment for five weeks.

In December of the same year he was sent to Poona-mallee, near Madras, the invalid depôt, and embarked for England on the nineteenth of that month.

On the passage home he had severe hepatic symptoms, with loss of flesh and strength, and was admitted into the Royal Victoria Hospital, Netley, on the 8th of April 1870.

State on Admission.—Presents a sallow, sickly appearance, is emaciated, skin and conjunctivæ slightly icteric.

Chest.—On a deep inspiration, the lower part of the right side is immovable; a line drawn from the nipple round to the spine would accurately cut off this portion. The right chest on percussion is dull, posteriorly as high up as the angle of the scapula, and anteriorly from two inches below the ensiform cartilage to the level of the nipple; a distinct fulness of the right side is perceptible from the sixth rib downwards, and the left lobe can be traced into the left hypochondrium. The swelling in the right hypochondrium is uniform and smooth; and the right side is larger than the left by two inches, the swelling giving an obscure sense of fluctuation to the finger. Veins were observed to ramify over the surface, extending downwards to the abdomen. The skin was harsh and dry, and pain in the right shoulder “of a very wearing kind” is present at times, but has intervals of ease and comfort. Decubitus dorsal—morning temperature 99°; evening 100°, 102°, 103°; pulse 100; respiration 20; dry cough.

This is a rough sketch taken from nature at the bed-

side. I think it tells you more than pages of dry general description.

On the following day 16 ounces of pus was drawn away by aspiration from the most prominent part of the swelling, between the seventh and eighth ribs anteriorly. Great relief followed the operation; the temperature fell two degrees. On the next day it rose again two degrees, and as the swelling was not diminished much by the first operation, the aspirating needle was introduced again 2 inches external to the first puncture, and 64 ounces withdrawn. Two hours after the operation the temperature fell to 98° , the pulse to 90, and the swelling of the side was less by an inch and one-eighth.

For five or six days the patient's condition improved; he took his food well, slept comfortably, had no night sweats, no pain in side or shoulder, and no cough, but for several nights the ward medical officer had noted a slight rise in the evening temperature, and on the morning of the sixth day after last operation it stood at 102 , and as there was again an evident increase of swelling, the aspirator was again used between the sixth and seventh ribs about an inch anterior to a line drawn from the centre of the axilla; 62 ounces of purulent fluid were drawn off, 52 of which consisted of reddish frothy-looking serum, the last 10 being thick tenacious pus, quite inodorous.

The greatest relief followed the operation, the temperature, pulse, and respiration falling as before in a most remarkable manner.

The operation was repeated sixteen times after the

above, and before his death, which took place on the 6th of October, purulent matter had found its way from an abscess on the convex part of the liver into the right lung, and was freely expectorated. In all, the enormous quantity of 600 ounces of pus was drawn off by aspiration. On each occasion the thermometer gave the indication to repeat the operation, which was invariably followed by great relief of all this suffering man's symptoms.

This was a typical example of multiple pyæmic abscess following dysentery of the most aggravated kind. You have in this large jar the preparation made of the parts, and you can see the ravages of this terrible disease.

Should a case like the one I have described fall to your lot, take a shorter method with it than I did; introduce a good sized drainage tube under strict anti-septic conditions. When O'Keefe's case was under treatment, an aspirating apparatus was a novelty, and I had more faith in it than I have now, as I shall presently explain.

Prognosis.—Abscess of the liver is at best a dangerous disease, and demands a cautious prognosis. When it occurs as a sequel of dysentery, for the reasons given above, the prognosis must be unfavourable.

An important element is the point of discharge. An abscess bursting into the pericardium or peritoneum is always fatal. As a rule, the issue is seldom fortunate when the discharge is into the pleura; and not much better when it points externally through an intercostal

space. When it takes place at the ensiform cartilage, in other words, when the abscess is in the left lobe, the prognosis is favourable. We see in this house many men return from India bearing evident traces of the successful discharge of an abscess at this point, and I may say all the cases that pointed in this way in this house have done well. Before the operation of evacuating abscesses by aspiration became common in India, nothing was more rare than to see the cicatrix of a liver abscess in an intercostal space; we know that many abscesses do point in this direction, and I draw the natural inference that the issue of such cases there has not been fortunate. The largest number of recoveries unquestionably follows discharge through the right lung, and next to that into the bowel. When air obtains free access into the cavity of a liver abscess, the result is seldom favourable, whatever be the position of the abscess. The occurrence of much hectic, emaciation, or diarrhoea is of evil omen.

It is needless to add that the prognosis is greatly influenced by the abscess being single or multiple. It is not always possible to give a confident opinion on the question of the existence of more abscesses than one. If the case is one with a dysenteric history, the presumption is that the abscess is multiple, and the prognosis as already said is bad. If an abscess has discharged, or is discharging through the lung, and the patient does not improve, but continues to suffer from hectic or diarrhoea, or both, and emaciates from day to day, it is nearly certain that other abscesses are

present, and the prognosis must consequently be unfavourable.

Diagnosis.—The diagnosis between suppurative inflammation and perihepatitis has already been given. It is hardly possible to mistake a hydatid tumour for a liver abscess; if we attend to the history of the case, a hydatid tumour is developed without pain or fever, it is perfectly smooth, and usually globular in shape. When percussed it communicates a peculiar thrill to the finger, quite different from the sluggish movement of the purulent contents of an abscess; if a doubt remains, the introduction of a fine exploring needle will settle the point.

Treatment.—Let me repeat at the outset of this part of my subject a word of caution I have elsewhere given. Before entering on a course of active treatment, look narrowly into the history of the case lest you fall into the serious error already adverted to in this lecture, of mistaking the end for the beginning of the case, in other words, of directing treatment to prevent what has already happened.

In a disease involving such serious destructive changes of structure, the first question that presents itself for careful consideration is the abstraction of blood either from the general system by venesection, or locally by cupping or leeching. When I first went to India, a medical man who treated a case of acute inflammation of the liver without one or other of the above measures, or both, would have exposed himself to the charge of trifling with a serious case. It was my fortune to serve

under a physician, in the early days of my service, who was a conscientious believer in the necessity of bleeding his patients, and who unflinchingly acted on his belief. I narrowly watched the results, and came to the conclusion, long before bleeding went out of fashion, that in the majority of the cases it was futile, in most, hurtful. Certain it is that in this gentleman's practice it availed little to avert suppuration, that where it apparently did avert it, the price paid for the good obtained was too heavy. Believe me, gentlemen, it is easy to abstract the vital fluid, but not so to restore it; a hot and malarious climate is not favourable to the growth of red blood. My advice to you is, seek measures for the better and more equable distribution of the blood, not its diminution. No doubt bleeding will often relieve pain, abate fever, and reduce the force and frequency of the pulse; but if we can attain the above ends by other means, why make our patients anæmic? I have seen the signs of suppuration follow so quickly as to suggest one of two conclusions, either that pus was formed before the bleedings were practised, or that its formation had been hastened by the proceeding. Where no such untoward event followed, the effect of the large abstraction of blood was to induce prostration, anæmia, a long stay in hospital, and protracted convalescence.

Mercury—Calomel.—Faith in the power of this drug to control inflammation of the liver was at one time almost universal; it went hand in hand with bleeding, and powerfully aided that measure in blanching the patient, and protracting convalescence.

The aim was to bring the patient as rapidly as possible under the constitutional influence of the drug; the theory being that if this could be accomplished, supuration would be prevented. A mere delusion. I have seen it used with this end in view by men deemed exceptionally skilful in its use, and was never satisfied that any good followed its use, other than could be explained by its purgative action, and I have seen supuration of the liver occur when the patient was actually salivated. This was Morehead's experience also.

In Waring's short but pregnant chapter on treatment, appended to his "Inquiry," he gives ample evidence that at best "it is of doubtful utility," and that its free use is undoubtedly "no preventive of hepatic abscess."

In thus dwelling on the futility of mercury as a remedy against hepatic abscess, I feel that I am engaged in what is sometimes called "pulpit exercise," putting up a man of straw for the satisfaction of knocking him down. I know, I have the best reason to know, that the practice is obsolete. Were it otherwise we should see with the arrival of every batch of invalids from India, one or more of them presenting in their persons evidence of excessive mercurialisation, which is not now the case. My object is to fortify your minds against a possible revival of the practice in the future by some enthusiast with little knowledge of the bad history of this "remedy." Such revivals are not so unusual in the history of our art as we might wish.

The proper place of calomel in the treatment of acute inflammation of the liver is as an important in-

redient in the purgative, which should be at once administered as the first step in the treatment; free evacuation of the bowels being a point of paramount importance.

I have argued strongly against the practice of bleeding, but there is a method of abstracting a small quantity of blood directly from the liver which I should be inclined to try were I again in a position to deal with this disease in healthy subjects in India. On several occasions in this hospital I have had the following experience. We have had men admitted here with symptoms pointing to the existence of hepatic abscess, with, at the same time, sharp local pain in the liver over well-defined limits; into such spots I have several times introduced the hollow needle of an aspirating syringe in the expectation of finding pus. On applying the syringe, instead of pus, 5 or 6 ounces of blood have been drawn off with immediate relief of all the symptoms, and without any unpleasant results. I have thus been led to think that in this way, at the sacrifice of a small quantity of blood in the acute stage of inflammation of the organ we might look for good results. I am sure of this, that I have seen this small bleeding much more effective than the abstraction of twice or even three times as much from the integuments over the liver by leeches or cupping.

I throw this out as a hint worth trial in cases where the symptoms are so acute as to raise in your minds a suspicion that the direct abstraction of blood might relieve pain and ward off the danger of suppuration.

The next step in the treatment after purgation, which I advise, is the administration of ipecacuanha in a full and effective dose, after the manner urged in the treatment of acute dysentery; not less than half a drachm. I think you will find this to be a very effective remedy; it quiets the circulation, and the nausea and diaphoresis it causes are highly conducive to the end in view. I can quote the evidence of Surgeon-General Massy, of Deputy Surgeon-General Laing, formerly of the 23d Royal Welsh Fusiliers, both officers of great Indian experience, and of many others who have used this remedy, in support of its efficiency. It has the inestimable advantage, already much insisted on, that unlike mercury it leaves no sting behind it. If necessary, the dose can be repeated in eight or ten hours. It often brings away large bilious evacuations to the manifest relief of the patient.

A combination of tartarised antimony in combination with nitrate of potash was much used by the late Dr. Cutchliff of the Bengal army, and is very effective. Two grains of tartar emetic are combined with 2 drachms of nitre, and divided into 8 powders; one is given every hour or half-hour in cases where the pain is urgent and the febrile condition well marked. Dr. Massy found this formula very successful.

I have often, in acute cases where the circulation is excited, in addition to the ipecacuanha, given aconite in drop doses every quarter of an hour, until 6 or 10 drops have been taken with marked benefit in reducing temperature, as well as the force and frequency of the pulse.

In addition to the above the side should be diligently fomented ; a few drops of turpentine being from time to time sprinkled on the cloth.

In a large proportion of cases the above means will prove successful ; even should they fail and the case go on to suppuration, the patient will be in a better condition to face this process than if he had been subjected to loss of blood and the depraving action of mercury.

An abscess having in spite of your efforts formed, or this having taken place before the patient came under treatment, the case is converted into a surgical one, and must be treated on sound surgical principles. Is the abscess to be allowed to take its course, that is to find a point of discharge by one or other of the routes already indicated, or are we to evacuate it by operation? You will find my name often quoted in text-books as strongly opposed to surgical interference. I think I had something to say for myself in support of my opinion in the days when the surgical interference consisted in first "exploring" the liver with coarse instruments in the shape of large trocars, such as are used in ascites. When an instrument of this kind entered an abscess its contents were at once drawn off. Air entering took the place of the pus ; the consequences were almost invariably disastrous ; the relief at first from the operation was always considerable ; but sooner or later, and often very soon, extension of the suppurative process went on, and gangrene around the orifice of the puncture generally closed the scene. When nature opens an hepatic abscess

she effects her purpose in quite a different way. Small openings are gradually made through the integuments, the pus slowly drains away, the walls of the abscess contract, little air enters, there is therefore much less chance of decomposition of the contents, and of the consequent destruction of tissue, and finally gangrene. Again, I often had occasion to notice that when an abscess, tending upwards to discharge into the lung, has been "successfully" entered by the trocar, and the abscess emptied, the end has been unfortunate, for the simple reason that the abscess has been evacuated by the route which gives the smallest percentage of recoveries, instead of by that which gives the largest.

These objections, gentlemen, were not merely theoretical, they were based on a large experience. I saw the method I have described carried out frequently by a surgeon of no mean acquirements. I refer to the late Dr. Murray, at the time I speak of, Inspector-General of H.M. Hospitals in Madras, who, when I was acting under his orders in the Queen's Garrison Hospital there, never missed an opportunity of endeavouring to save patients in this way. At Hyderabad in the Deccan my experience in cases of this kind was very great. I modified the operation in various ways; I made valvular openings, I used canulas, with stop-cocks to exclude atmospheric air—all in vain—in spite of my efforts it found access, and as antiseptics were not in those days, the outcome of my efforts was rarely encouraging.

As soon, however, as proper instruments were at my disposal, I venture to say that I used them, and sanc-

tioned their use in this hospital as often as any man now living. I was the first to use the syringe of Bowditch to evacuate an abscess of the liver, and successfully too, in the case of a soldier admitted from Abyssinia. Since more elaborate aspirating instruments have come into use, they have been turned to account in this hospital in every case deemed suitable, not only by myself, but also by my much valued colleagues, Drs. Fyffe, Webb, Veale, and Cherry.

With the fine needles in the aspirating apparatus the liver may be searched with safety for an abscess as soon as the local and constitutional symptoms indicate its existence. At first I was in the habit, after emptying an abscess, of waiting until the thermometer gave the indication to repeat the operation. I am indebted to Dr. Veale for a better method, and that is not to wait, but to introduce the needle every second or third day, and thus to prevent the accumulation of pus, and further destruction of lung tissue.

But where the abscess is large, as evidenced by the extent of swelling, I advise you to proceed in a different way. Evacuate the abscess, and, under the strictest antiseptic method, introduce a good-sized drainage tube into the cavity, allowing it to discharge into a mass of antiseptic tow or other material. This method has given us in this house most satisfactory results in cases the most unpromising.

Is it needful to add that the patient's strength must be sustained by suitable food, by the mineral acids, with small quantities of quinine, and the regulated use of

stimulants ; placing the patient under the best possible hygienic conditions, and the most watchful care to secure him fresh and pure air, and plenty of it. The recoveries that take place under the above system are often very surprising, and in a high degree encouraging.

It has several times occurred to me to see the good effects of pure air in the case of patients seen in consultation with some of my professional friends in Southampton. Patients landed from tropical climates discharging an hepatic abscess, say through the lungs, go at first into lodgings at a low level near the sea ; when moved up to the higher parts of the town they improve in a very striking manner.

In cases which have not gone on to suppuration some care and watchfulness are required. The bowels require to be regulated, and the best way of effecting this is by the use of some of the bitter saline waters,—Friedrichsall, Pulna, or Hunyadi Janos,—with a course of nitro-muriatic acid, long continued, and the use of the hydropathic belt already described under the head of Dysentery ; and it is well to have the water-pad in this apparatus moistened with water containing diluted nitro-muriatic acid. Cases resisting this treatment, showing symptoms usually described as those of chronic hepatitis, with dull aching pain, and some degree of enlargement of the liver, with loss of appetite, a muddy complexion, irregularity of bowels, and loss of flesh, should be sent home ; and, speaking on this point from a large experience, I advise all those in this condition, whose means admit of it, to seek the relief they will

surely find by a course of the waters of Karlsbad or Homburg.

You may remember that I showed you a preparation of a cyst that once invested a liver abscess. Here it is again. You observe that it is as stout as a bit of wash-leather. Now, patients suffering under symptoms of acute hepatitis, followed by the signs of suppuration, sometimes surprise their doctors by gradually recovering. The uneasiness in the liver subsides, the signs of constitutional irritation pass away, and they resume active life, sometimes very active life. This cyst, which I hold in my hand, explains it all. The abscess is there, but it is cut off from the rest of the gland, it has become stoutly encapsuled. In process of time, perhaps, it thins at some point, and when straining at stool, or lifting a neavy weight, or something of that kind, the pus, or a portion of it leaks out, and alarming symptoms set in, always fatal, or the contents escape with a gush—collapse instantly follows. I have recorded some cases of this kind in Russell Reynolds' *System of Medicine*, and I know of several others. One was a cavalry officer who surprised his doctors and friends by an apparent recovery from hepatic abscess under apparently hopeless conditions, who after several years of good health died suddenly in the manner described. In another case, also of a cavalry officer, who suffered from acute hepatitis in India, for which he was sent home, the symptoms gradually subsided, and he enjoyed life as much as most men, riding to hounds with great boldness. Curiously enough, in this case, it was not during or immediately after violent

exercise in the hunting field, but when living quietly, that fatal symptoms and collapse occurred. After death it was found that the cyst of a small abscess in the right lobe had thinned and given way, followed by extravasation of the pus it had so long confined. I can give you no statistics as to the frequency of this occurrence; but if you examine the preparations before you, you will see that a large number of them have an investing cyst. Clearly, however, it is only where the abscess is small and the investing cyst stout, that the pus can be confined in the manner I have described.

LECTURE XV

BERIBERI

WITHOUT taking up your time in an attempt to give you an explanation of the derivation of this barbarous term, let me say that by universal consent it is used to designate a disease which, so far as India is concerned, prevails mostly on the Malabar coast, not extending inwards more than 60 miles from the sea, and most prevalent in the districts known in the Madras Presidency as the Northern Circars (the Five Northern), an old division of that Presidency. The Five Northern Circars were formerly Chicacole, Rajahmundry, Ellore, Condapilly, and Guntoor; but the tract now comprised within them is divided into the districts lying along the coast occurring in the following order, proceeding from south-west to north-east—Guntoor, Masulipatam, Rajahmundry, Vizagapatam, Ganjam. It is a common disease in Ceylon. The district between Masulipatam and the Chilca Lake extends about 400 miles along the coast, and is bounded by the sea to the north-east and to landward by deeply wooded hills, which, except in the hot weather, are the most destructive to health of any in

India (Malcolmson). Along this coast are many belts of salt and fresh water swamps, flooded by the rains and high tides; the soil is sandy, and has to a considerable extent been formed by the retirement of the sea. The swamps in many places are below the level of the sea, and are separated from it by sand-hills thrown up by the surf and blown inland. Rice grounds freely watered abound, with also a considerable portion of dry cultivation. Malarial fevers, often of a malignant form, are common, greatly favoured by back waters formed by the overflowing tides and floods.

Beriberi is an extremely fatal disease, characterised by anæmia in an extreme degree, numbness and motor paralysis, chiefly of the lower extremities, scanty and high-coloured urine, general œdema, with effusion into the serous cavities, chiefly the pleura and pericardium, occasionally acute pain and oppression at the epigastrium; death occurring generally suddenly, either from dropsical effusion into the thoracic cavities, failure of the heart, or embolism.

Causes.—These are obscure. From what I have said it will be seen that the conditions of soil, climate, and water are not conducive to health in the districts in which it most obtains. It is towards the close of the rainy season that the disease prevails most, when the alternations of temperature are most considerable—poverty, with what it brings in its train, want of sufficient clothing to guard against the changes of weather, poor food, and the long-continued action on the system of impure water; in a word, all the causes that tend directly

and indirectly to bring about anæmia, are among the chief factors. Anything like good drinkable water is rare in the district where this disease is most common. The late Dr. Evazard, a contemporary of mine in India, dwelt on the effects of the brackish water in the Masulipatam district as one of the most powerful agents in the production of the anæmia so common there. The jail population in the Northern Circars, more particularly when their diet was poor and deficient in anti-scorbutic elements, suffered severely from beriberi. Speaking from personal observation, the same cause in my time was in active operation among the Sepoys serving in Burma. Giving up a large part of their pay for the support of their families left behind in India during their service in Burma, it is notorious they pinched themselves to the sacrifice of their health, living on half the allowance of food they were accustomed to in their own country; they invariably returned half-starved, and more or less scorbutic, and in this anæmic condition, if exposed to the climatic conditions of the beriberi districts, numbers of them suffer from that disease.

This was very notably the case after the first Burmese war among the native regiments returning from that service and quartered in the Northern Division.

I am strongly of opinion that scurvy plays a much more important part as a predisposing cause than is generally suspected. Having inspected more than one regiment recently returned from Burma, and having been in medical charge of one which had served there for three years, having in fact returned to India with it, I can

testify to the fact, that a very large proportion of the Sepoys were scorbutic, and that after landing in India, beriberi appeared among them, although they were quartered, not in the Northern Division, but within a few miles of Madras. In support of this opinion I point to the fact that European soldiers in India do not now suffer from the disease. In two and twenty year's service there, I never saw a case of beriberi in a European; yet in bygone times it was not uncommon. Malcolmson mentions deaths from it at Masulipatam in the 1st Madras European Regiment, and among the European pensioners at Vizagapatam, and British soldiers in Ceylon quartered on the coast suffered from it. Why not now? I believe the chief reason is the enormous improvement in the food of the soldier, and above all, in the extent to which scurvy has been banished by the more constant use of anti-scorbutic ingredients in the ration.

Symptoms.—Like many other diseases we see it in two forms: acute and chronic. Looking into the recorded cases collected by Dr. Malcolmson in his essay on beriberi, we are struck by the suddenness with which many of the sufferers were struck down without apparent warning—the whole duration of the case not exceeding twenty-four hours—with intense anæmia, paralysis, general œdema, and effusion of fluid into the cavities. One is led to suspect that in many cases with such a history as the above, there were probably warnings in the shape of symptoms either disregarded or concealed. Any one acquainted with the ways and habits of native

soldiers knows their unwillingness, as a rule, to submit themselves to medical treatment in hospital, where they are to a great degree cut off from intercourse with their families and friends. Take the following example recorded by the surgeon of the 37th Regiment Native Infantry:—

“A Sepoy belonging to the Grenadier company, a remarkably stout man, was admitted into hospital on the morning of the 21st October, with urgent dyspnoea, total inability to move his body or limbs, which, as well as his face, were much swollen, with a sensation of fulness and tightness of the skin, pulse 90, full and firm—no sickness at stomach or complaint of pain in any part of his body—said he went to bed quite well last evening, after a hearty supper of rice as usual, and this morning early was attacked by his present symptoms. He was bled to 16 ounces, and calomel with squill was ordered. The dyspnoea returned severely in the evening, continued all night, and he died rather suddenly next morning, having been ill only for twenty-four hours.” There is no record of any *post-mortem* examination.

This is a typical case. Sometimes the paralytic symptoms are marked, in others the dyspnoea and dropsical symptoms are more urgent, sometimes the paralysis is preceded by pain, it may be in the thigh, or in the ankles, or low down in the lumbar region. In all there is evidence of intense anæmia, more or less anasarca, prostration, quick and usually small pulse, temperature a degree or a degree and a half below the normal, an exanguineous state of the tongue and con-

junctionæ, and scanty urine, and, as in the case I have given you, death is usually sudden. Looking over the records in my possession, as well as those in print, I find "found dead in bed," a frequent entry.

In the more chronic cases the symptoms are the same in kind, differing only in degree. In the acute or inflammatory form there is distinct feverishness, the numbness and loss of power preceding the acute œdema, dyspnœa, and effusion into the serous cavities.

The form of the disease of which I have seen most occurred in Sepoys returning broken down and worn out by foreign service in climates uncongenial to them, where they have undergone privations and used food to which they were not accustomed. In some cases the disease is to all appearance arrested, but often reappears, and in others when least expected acute symptoms supervene and the patient is quickly cut off.

Diagnosis.—This in India is not difficult. There, in the present day, it is almost entirely confined to natives, and, as we have seen, mainly to those who have resided for some time in the districts where the disease is endemic. The numbness, followed by motor paralysis, the general œdema, the rapid effusion into the serous cavities, the anæmia, the pale tongue, costive bowels, and fluttering heart sufficiently distinguish it.

Prognosis.—After what has been said, this, it is evident, is unfavourable, the rapidity with which œdema sets in, and the pericardium and pleural cavities fill, and the frequency of sudden death either from this effusion, or sudden failure of the heart's action from degeneration of

its muscular structure, or perhaps, more frequently than from other causes, embolism must be kept in mind. Statistics show it to be a disease almost as fatal as cholera. The more rapid the general œdema, the more urgent the dyspnœa, the more uncertain and feeble the heart's action, the greater is the danger. Nausea, vomiting, a dry and black tongue, and hiccup, indicate danger. On the other hand, the more gradually œdema sets in, the less the chest organs are affected, the more favourable is the prognosis. When the digestive functions are little implicated, and the kidneys continue to secrete a fair amount of urine, a favourable issue may be looked for.

Morbid Anatomy.—The most constant condition found after death is a watery condition of the blood, with an immense diminution in the number of red globules, and the presence of water in every organ and tissue of the body. The lungs, the heart, the substance of the brain, its ventricles, the pleura, pericardium, and peritoneum are all more or less charged with fluid. The heart is generally enlarged, soft and flabby; and in some cases hypertrophied, the result, we may suppose, of the difficulty of driving the hydræmic blood through the system. The spinal cord is almost always congested; fluid is found in the spinal cavity—conditions which explain the paralytic symptoms during life. Malcolmson in his essay on beriberi (1835) gives a drawing of the cord, showing a mass of lymph opposite the fourth lumbar vertebra, and another lower down in process of becoming organised, vessels containing red blood passing

into its substance. The kidneys are usually enlarged, soft, and easily torn, not otherwise diseased.

Treatment.—This, it must be confessed, is not generally satisfactory. As I have mentioned, numerous cases from the suddenness with which urgent symptoms threatening life appear, are seen when little time is left for the action of remedies. The indications are plain enough: to ward off the danger of sudden death, to relieve the organs of the fluid, with which they are charged, to cure the anæmia, and correct the scorbutic diathesis, which I am persuaded underlies this constitutional disorder, and to relieve the cord from the pressure which is the cause of the paralytic symptoms.

When we turn to the record of treatment preserved for us in the Essay of Malcolmson, so often referred to, taken mostly from the case books of native regiments serving in the Northern Circars, the endemic area of beriberi, we are surprised to see that in a large number of the cases, treatment took the shape of bleeding and mercurialisation. We cannot read the history of such cases without seeing how little at that time the teaching of Laennec had penetrated into India. Bleeding was directed evidently against the urgent dyspnœa, due to the presence of fluid in the chest cavities, or to failure of the heart's action, or both; it is not difficult to understand that against such conditions it was not only a futile but a hurtful measure. Malcolmson himself condemned it save in a few exceptional cases. Mercury acting constitutionally could only add to the already depraved condition of the blood. This, again, Malcolm-

son saw, and not only points out its inutility, but says he has seen men have their first attack of beriberi when salivated.

In cases where careful physical examination of the chest convinced me of the danger of a patient being "drowned out" by a great accumulation of water on both sides, say nearly up to the clavicles, so that he was struggling for breath and incapable of lying down, as in many of the recorded cases of the acute variety, I would unhesitatingly perform *paracentesis thoracis* by aspiration.

Where the symptoms are less urgent and time is afforded for the action of remedies, I would use Bowditch's solution of iodine to the chest (ʒss. to ʒi. of spiritus etheris sulphurici), maintaining with this a considerable amount of stimulation of the skin. By the use of digitalis, acetate of potash, and where strength admitted, hydragogue purgatives, particularly the bitter German waters where available,—Friedrichsall, Hunyadi, or Pulna,—I would stimulate the kidneys and bowels to relieve the general dropsy.

By a liberal diet, a generous allowance of good wine, and steady perseverance in the use of iron and quinine, I would seek to improve the condition of the blood, and to sustain the heart, taking care at the same time so to regulate the diet as to correct the scorbutic diathesis.

The stimulating application advised for the chest I would use as freely down the whole length of the spine. The paralytic symptoms still continuing, as soon as the more urgent chest symptoms are relieved, I advise

a course of iodide of potassium in combination with quinine, which often acts extremely well. To the above should be added warm clothing to enable patients to resist sudden changes of temperature, to which they are extremely sensitive. I need hardly add that where possible removal of the sick out of the endemic area of the disease is a point of the first importance.

There is no condition of the system more difficult to deal with than anæmia, particularly when it attains to such a degree as we see in this disease. I have great faith in the judicious use of arsenic in this condition, and would use it freely in the chronic forms of beriberi.

I cannot pass from this subject without a remark on the necessity for better treatment of native troops when sent on foreign service. As the matter stands they are neither fed nor clothed sufficiently, and the consequence is they suffer fearfully, die in large numbers, and are useless for the service on which they are sent: this is a condition of things which ought not to be—it is neither politic nor humane. I should hope that a reform in this matter will soon take place. I have said that the system of sending native troops to die on foreign service because they are not properly fed and clothed is not politic; the survivors who return, broken in health for life from some of our wars, carry with them reports of their treatment, which, circulating among the class to which they belong, are not conducive to the stability of our Government.

There is no man living at this time whose opinion on a question of the health of our army, European and Native,

is of greater value than that of Surgeon-General Sir Anthony Home, V.C. I have this experienced officer's authority for the fact that some of the native regiments sent into Afghanistan in our late campaigns were at once rendered useless from scurvy, the outcome of a diet defective in anti-scorbutic elements. It is time that those who have to concern themselves with the food of soldiers, both Native and European, in peace as well as in war, should awaken to the fact that scurvy is not confined to those who "go down to the sea in ships."

I must not pass from this subject without referring to two remedies in much use among natives in the Northern Circars in the treatment of beriberi, viz. *Treak Farrook* and *Oleum Nigrum*. It was Mr. Geddes of the Madras Army, who finding bleeding, mercurials, diuretics, and purgatives of little use in curing his patients, first tried *Treak Farrook*, which he found more successful in removing the œdema and lowering the pulse than any other remedy; he did not find, however, that it had any influence on the palsy. The composition of this medicine is not known; it is made in Venice, and reached India through the Arab physicians. It professes to be the *Theriaca Andromachi*. I have seen it, and can confirm the description given of it by Dr. Aitken, viz. that "it is a thick extract into which some terebinthine material largely enters." It is given in pills in combination with rhubarb and aromatic confection. In this form it acts as a mild purgative, and although Mr. Geddes in his trials did not find it effective as regards the paralysis, other medical officers of the Madras Presidency

who used it, speak more favourably of it. With it, however, it is to be noted that a liberal diet of "animal food, wheaten cakes, and milk" is considered essential by the Native doctors. Was it this good diet or the *Treak Farrook* that brought about the improvement?

The so-called *Oleum Nigrum* remains to be noticed. This is an empyreumatic oil prepared from the seeds of the *Celastrus nutans*, a plant which grows in the jungles which cover the hills of Ramteak, north of Nagpore. The native name of the seeds is *Malkungnee*. Benzoin, cloves, nutmegs, and mace enter into the composition of this drug. The natives use this in betel leaf; when given to Europeans it is made up into pills, which are inconvenient from their size. This remedy was largely used by Dr. Herklots of the Madras Army, who declared he only lost 1 in 50 of his patients under its use, while under other means of treatment he had 11 deaths out of 15 cases. Dr. Herklots gave it in 15℥ doses twice a day; "the effect being to mitigate the symptoms on the second day, when the œdema begins to lessen; by the fourth day the œdema is gone, and the medicine is relieved."

Trials made by others, among them Malcolmson, established the fact that the remedy has some power as a diuretic in removing the œdema, and sometimes it acted on the skin causing free perspiration without exhaustion. Malcolmson found even a dose of 8 drops inadmissible when there is tenderness at the epigastrium; it caused pain in the stomach, a red and fiery tongue, and other signs of gastric irritability. In

short, the experience of others does not appear to have borne out the confident statement of Herklots.

I think a cautious trial of Jaborandi might be made ; it would be quite as safe as elaterium, which has been freely used, and not without good effects in this disease.

Bandaging the lower extremities with flannel bandages is always a comfort to patients, and it promotes absorption of the fluid.¹

¹ In the text I have pointed to the fact that beriberi is hardly ever seen in the present day among European soldiers in India, and I have attributed this to the great improvement in the diet of the soldier. While the lecture on beriberi is passing through the press, the *Kölnische Zeitung* reports that the Dutch European forces in their Eastern possessions are suffering severely from this disease. In the four years from 1879-1883, 17,722 soldiers were under treatment for beriberi. Between deaths and invaliding the annual loss is said to amount to 1100. This is not all, more than half the strength of the force is reported unfit for active service from the sequelæ of the disease. The predisposing cause is bad food, and the Dutch newspapers demand that the troops shall be better fed. The Dutch are a frugal people, but they evidently have to learn a lesson our own authorities had to acquire in the dear school of experience, that it is bad economy to save money on the food of their troops serving in bad climates (Vide *British Medical Journal*, 7th August 1886).

LECTURE XVI

GUINEA-WORM

It is not my intention to enter on the natural history of this nematoid parasite known as the *Filaria Medinesis*, or *Dracunculus*. You find all that is known on this subject in the great work of my colleague, Professor Aitken, embodying, as his chapter on the subject does, the researches of Bastian, Carter, Forbes, Busk, and other authors. I merely wish to invite the attention of those about to serve in India, more particularly those whose practice will be much among native soldiers, and natives of India generally, that they will have much to do with this intruder into the human body. Dr. Aitken quotes a statement made by my late friend Dr. Lorimer, of the Madras Army, to the effect that every native regiment which has occupied the lines near the Hossein Sagur tank at Secunderabad, suffered from *Dracunculus*. Now, for more than ten years my sphere of duty as Residency Surgeon at Hyderabad, within a few miles of this great tank, gave me ample opportunities during the months of March, April, June, and July of seeing the extent to which this parasite afflicts the people in that

neighbourhood. At my hospital hardly a day passed without my seeing one or more, sometimes four and five cases, and without our having to open one or two abscesses, each containing a dead *Dracunculus*. In some, by no means in all, the worm had been broken in attempts at extraction, irritation, inflammation, and abscess followed; but in many instances the worm was unbroken. The wandering nature of this parasite is well known, and although it is generally said that its favourite *habitat* is the lower extremity, I have found these creatures presenting themselves in all parts of the body, back, side, arms, and not unfrequently in the scrotum. I by no means wish it to be understood that all patients thus presenting themselves came from the neighbourhood of the above named tank; many did, but in no part of India have I seen so many cases of *Dracunculus* as in the out-patients of the Residency Hospital.

Symptoms of the Presence of Guinea-Worm in the Human Body.—It is only when the creature has accomplished its destiny, fulfilled the purpose that leads it to use the human race as its host, that men are conscious of its presence; in other words, the symptoms appear when the worm is making its exit. These are pricking, itching, a sense of heat, then a vesicle appears of varying size; when this is opened or bursts, the head of the worm appears, or this may not be for some weeks. As soon as enough of the worm emerges from the aperture, the custom is to wind it up on a bit of stick or small twisted roll of paper. The native barbers, with

their small and light hands, are great practitioners in this art, and seldom break the worm; the practice of douching the part with cold water aids the extraction, and this practice is universal in India. The worm is usually about one or two feet in length; some writers speak of worms of six feet; out of the many hundreds of guinea-worms I have seen, I never saw one exceed three feet, much more frequently from one to two is the ordinary length. This mode of extracting the worm has been practised in the East for ages. It is needless to add that great gentleness is required in the process, for although it possesses considerable elasticity, anything approaching to roughness is certain to break it, and this is invariably followed by local irritation, often followed, as I have mentioned, by abscess.

The late Dr. Cobbold seems to have abandoned the now usually accepted opinion that the worm finds access to the human body through the ducts of the skin. He seems to have embraced the opinion of the Russian naturalist, Fedschinko, that the males and females of the guinea-worm, after acquiring their larval state in the bodies of certain aquatic crustaceans, are transferred to the human stomach, where they copulate, producing a progeny, the males then perishing and passing away per anum, while the females remain, to migrate through the tissues to the surface of the body.

The experiments of Forbes seem to make it clear that the young guinea-worm *Filaria* cannot live in the mucous membrane of the stomach. The fact mentioned by Carter, which Cobbold quotes, viz. that out of fifty

boys bathing in a tank swarming with microscopic tank worms, no less than twenty-one were attacked with *Dracunculus* during the year; whilst the boys of other schools, bathing elsewhere on the island of Bombay, were, with one or two individual exceptions, not affected, does not seem to support the theory of Fedtschinko, rather, it appears to me, the other way.

While on the subject of worms let me mention a fact that escaped my recollection when dealing with Remittent Fever.

It constantly occurred to me to have children brought to me, girls and boys, from the city of Hyderabad, at ages ranging from ten to fifteen, in a high fever, with foul tongues, tumid bellies, and marked loss of flesh. On giving to such patients pretty full doses of quinine suited to their age, I have been amazed at the enormous number of round worms (*Ascaris lumbricoides*) killed and expelled after the first or second dose of quinine; as many as fifty at a time I have known to be expelled in this way. After a time I became so familiar with the appearance of those thus affected that I could recognise them at a glance; an almost invariable appearance was rawness about the mouth, extending sometimes for a quarter or half an inch on both cheeks, the same raw condition appearing about the nose, the result of incessant "picking" under the reflex irritation caused by the presence of these intruders. The addition of iron in some shape, doubtless from its action on the mucus in which the worms lodge, was found a powerful aid in expelling them.

When on service in China in 1840-42 our men, Native and European, suffered severely from the *Ascaris lumbricoides*. Speaking from personal experience I hardly know anything to equal the misery, dreadful nausea, and distress caused by the presence of a large worm of this kind when it finds its way into the stomach. An emetic is the only remedy, which should be followed up at once by quinine and iron for the destruction of one or more companions left to haunt the small intestine.

THE CLIMATE OF INDIA

It was my intention to have prefixed to this Summary of my Lectures on Tropical Diseases an account of the topography and climate of India. I soon found that a topographical description of this kind to be of any value for health purposes, would require a volume nearly as large as the one devoted to the diseases of the country, particularly if to topography a minute account of the climate of all the natural divisions of this vast region was added. I have therefore determined not to add to the bulk of this manual by any attempt of this kind. Year by year the Government astronomers contribute to the Reports of the Sanitary Commissioners of the three Presidencies notes on the meteorological phenomena of every month in the year; in time very valuable *data* will thus be accumulated, which cannot fail to be of great value from a sanitary point of view.

The Royal Commissioners who inquired into the health of the army of India, placed in Mr. Glaisher's hands all the documents in their possession relating to the climate of India; Mr. Glaisher prepared for them a short summary of the geographical distribution of atmospheric phenomena over the peninsula of Hindostan.

“India,” according to Mr. Glaisher, “enjoys in its temperature perpetual summer on the plains; it has there no frost or snow; the heat, however, is as excessive there in some months as the cold is in India in others; and rain is as abundant in the rainy season as it is frequent in England. He shows that the observed elements of climate vary with the latitude, longitude, and elevation; that there is higher temperature and a much larger amount of dissolved water in the air than in England, although the relative amount of moisture to temperature is less in India. But as far as relates to the influence of moisture on health, the actual amount of dissolved water may be taken as indicating the amount of organic matter in the air, of which water is the solvent and vehicle; and hence, although the relative amount of water in the air in India is less than it is in England, the atmosphere, considered in relation to the effect of humidity on health, is more humid than in England.

“The sensible effects of climate in India vary as widely as the physical characters of the country. On the plains and deltas the climate is hot and moist with considerable rainfall. In the southern parts of India there is heat and dryness. On the mountain ranges the temperature falls with the elevation; and at certain altitudes diminution of heat is accompanied by a perceptibly moist condition of the air. Along the face of mountain ranges exposed to the monsoon, there is an excessive rainfall, to be measured by feet rather than by inches, while within a short distance to leeward, the atmosphere is dry and clear, with little rain. The

climates of the seaboard vary with the direction of the wind ; sometimes they are comparatively cool, while at others they are warm, moist, and depressing. The climates of certain mountain groups and tablelands are almost as healthy as those of southern Europe ; while at the base of the same mountains there are local climates, which are absolutely pestilential.

“At the majority of the stations occupied by British troops there is a high mean temperature, accompanied with much dissolved moisture. At many of them there is a considerable difference between the day and night temperature, accompanied by night and morning fogs, and by a feeling of coldness succeeding a high temperature during the day.

“Heat, moisture, and variation between night and day temperature are the three special climatic conditions to which the soldier in India is exposed, and except in so far as the degree of humidity is the result of local defects in drainage, these conditions cannot be changed, unless by resorting to mountains or tablelands as sites for military stations.”

FAREWELL ADDRESS

It may interest some of my old Netley pupils to read the following farewell words addressed at the conclusion of my last course to the surgeons on probation, then passing through the school:—

“It is an open secret that the lecture I have just finished is the last I shall ever deliver. My teaching career is over; some other duties remain to be discharged before the tie that binds me to this school is severed; but when next term opens another will stand in this place and address those who will occupy these benches. I have determined to retire while such powers of exposition as I could ever boast of remain to me unimpaired, before it can with truth be scornfully said that

‘Superfluous lags the veteran on the stage.’

“Before I was called from India to fill the chair I am about to vacate, after a period of somewhat varied service, ten laborious years were spent in the difficult work of teaching the medical sciences to the Mohammedan students through the medium of their own language; the success that attended this attempt, the first of the kind in India, led to my being invited to undertake the responsible duty of the Chair of Military Medicine in this

school—a position I have held for more than twenty-three years. Without affectation or mock modesty, I cannot look back on these long years without a consciousness of many shortcomings. Had the selection of an Indian medical officer to fill this chair rested with me, another would have been chosen. I can only honestly claim to have done my best to acquit myself of my great responsibilities, and I can with truth say, that a consciousness of those responsibilities has hardly ever been absent from my mind during every waking hour of my life since I undertook them.

“Since this school was opened by the late Lord Herbert, in October 1860, 1476 medical officers for the British Army, the Royal Navy, and the Medical Service of the Government of India have passed through it. Out of this large number some have died on distant fields of battle, many more, with equal honour, have lost their lives while doing their duty in hostile climates, far from their native land. Many remain scattered in the service of their country in different parts of this great empire. To them my thoughts naturally turn this day. They *now*, and you in the early future, are and must be the best judges of the kind and quality of the instruction given from this chair. Those who have gone out into the world from this school have put to the test the weapons wherewith they have had to fight the disease of many climes; if those weapons have broken in their hands, then my life here has been a failure, I have laboured in vain, and been an unprofitable servant.

“The price paid by this country in human life for

its greatest possession, has been, in the language of commerce, a 'long' one. As you have often been told on the authority of the Royal Commissioners, who reported on the health of the army of India in 1859-60, the mortality of the European portion of it oscillated round the enormous figure of 79 per 1000. How stands the case now?

"In 1882 the death rate for all India was only 13.07 per 1000 from all causes.

"In Bengal for the same year it was 12.07.

"In Bombay it was only 10.37; and in Madras for the year 1883 (a cholera year) it was only 10 per 1000. In what I have often here called the 'pre-sanitary age' I have known one disease, tropical dysentery, kill 1 in 5 of those attacked. I have known a regiment with an average strength of 1098 have 2497 admissions into hospital in one year, with 104 deaths, mostly from two diseases, dysentery and its common sequel tropical abscess of the liver; being nearly 10 per cent of strength. In the same part of India in the year 1883, out of a force of 13,000 men, with over 500 cases of dysentery only 3 proved fatal, and malarial fevers, once so destructive, in the same body of men caused only 2 deaths.

"To bring about such an enormous saving of life many factors have contributed. They have all been much insisted on, not only by me, but also by my colleague, the Professor of Hygiene, whose province it is to deal with general health questions. I do not undervalue them, far from it, no one can be more im-

pressed with their immense importance than I am. I am all the more entitled to say so because, long before I became connected with this school, I take leave to say, there are few of the ameliorations in the life and surroundings of the British soldier in India, embraced in the comprehensive term 'Sanitary Reform,' that were not urged by me on the attention of the authorities in that country through every channel open to me, and this at a time when advocacy of this kind was not always pleasing to those in power, or calculated to lead to personal advancement. After the largest possible allowance has been made for the beneficent operation of the means referred to, a share in the splendid results may reasonably be claimed for the successful treatment of disease. Notwithstanding the great sanitary improvements that have taken place, a vast amount of disease of the gravest kind remained to be dealt with by the medical officers of the army, for the most part trained in this school. Unless treatment had to a large extent kept pace with sanitation, the results we contemplate with so much satisfaction could not have been obtained. If this is so, and the fact appears to me undeniable, we may claim for this school that the money spent on it has not been spent in vain, and the wisdom of those who founded it has been justified.

"As another opportunity may not offer, I embrace the present one to give, not an apology, but an explanation, which is quite a different thing, in reply to a writer in a professional journal who has censured the professors generally, and, if I rightly understand him, the professors

of surgery and medicine in particular, for withholding from the profession the clinical experience gained in this hospital.

“Speaking on this matter entirely for myself, I must explain that in the early days of my professorship I began to publish, from time to time, some of the lectures delivered by me here; my object being, so far as I could, to keep touch as it were with old friends and pupils who had left the school for duty in the service, and it was my fixed purpose to continue this practice from time to time as interesting and important material for lessons in military medicine turned up. An ‘un-toward event’ happened which, rightly or wrongly, I do not say, defeated this intention. An epidemic of yellow fever broke out in an important station in the yellow fever zone, attended with a lamentable mortality. A graphic narrative of this outbreak, and all the circumstances preceding and attending it, was published in the following year by the principal medical officer who had been hurriedly sent to the scene of the epidemic. This was published in the Official Departmental Blue Book.

“In this outbreak 14 officers out of 30, nearly 50 per cent, died, 4 out of 6 medical officers, one of whom had just left this school, lost their lives, and out of 290 men attacked 107 died. That this lamentable loss of life, which took place between the 5th and 15th of September 1864, was due to causes distinctly preventable has never been disputed by any competent authority. This epidemic, as it was my duty to show in this lecture room, did not come upon its victims without giving

ample notice of its approach, and time for providing for the safety of the troops. Warning of the coming danger was given by competent medical authority, which warning was neglected until the day of grace was past.

“Here was an opportunity of teaching an impressive lesson in military medicine by an example. Accordingly I made the narrative the ‘text,’ as it were, of a lecture, which, after delivering it here, I published. I did not invent the facts, I took them as I found them in a published official document, I only ‘pointed the moral’ of a ‘tale’ told by another, an eye-witness. I do not pretend that the commentary was flattering to those concerned, but it did not go beyond what the case demanded, if any lesson was to be taught from the facts.

“No sooner did this lecture appear than a great storm arose and burst on my head. So far as I was able to gather, the local authorities did not dispute the facts, they were angry at the publicity given to them. General Peel, then Secretary for War, was appealed to by those who felt themselves aggrieved; mostly, I believe, the municipal authorities of the place. My lecture, by the war minister’s desire, was submitted to his inspection. The judgment of this high authority, to whom alone I was responsible, was that he had no fault to find with it. At the same time with a view, I presume, to prevent similar disturbances and complaints in the time to come, the Secretary for War was pleased to direct that in future all lectures delivered here should be submitted to him before publication. From that time to the present no lectures delivered in the Army Medical

School by any of the professors have been published, with the exception of merely formal addresses delivered at the opening of the sessions, and then only for private circulation.

“I wish it to be distinctly understood that I have never in word or thought called in question the absolute right of the Secretary for War to issue such an order. That goes without saying. But, speaking in this matter entirely for myself, it operated as a check on me, for I am so constituted that I cannot publish under a censorship however mild, judicious, or even generous.

“But, although for this reason unable to publish the lessons delivered here, it is for you and those who have gone before you to say whether or not I have withheld from you the instruction I have myself acquired in the magnificent field of medical observation this hospital has afforded me.

“Passing from this subject, on which I have touched with reluctance, let me say I do not affect to conceal that it is not without a pang I find myself at the end of my active life. It pains me to think that never again can I see before me young, ardent, and ingenuous faces looking frankly into mine, and to reflect that in the time that remains to me in this life, I must be cut off from intercourse that has ever been one of the greatest pleasures of my life, and which I have often thought, by a reflex action, has kept me young in mind if not in years.

“Of the colleagues with whom I have so long laboured I can hardly trust myself to speak—one is

not whose mere name, 'appealing' as it does 'to feelings and affections kept within the heart like gold,' is a household word here, and whose work will not soon die. Of those who remain, and of those who in past years have been my assistants in my own department of work here, I can only say I deem it a great honour and distinction to have been thought worthy to be their colleague and fellow-labourer, and I assure them my feelings of warm friendship can pass away only with myself.

"One word more, I wish, were it only as a parting memorial of the deep and abiding interest I take in the future of this school, to express a hope, I can do no more, that it will long continue to fulfil the purpose for which it was established ; that the fundamental principles on which it was based and has hitherto rested, will be respected. They were settled by a wise and far-seeing statesman and man of affairs, aided by educational experts the most competent of their day. All educational institutions are of course susceptible of improvement, but every point in the constitution and government of the school was carefully thought out, and I am certain cannot be tampered with without danger to the whole fabric. It is a matter of the greatest satisfaction to me that I am to be succeeded by a medical officer of distinction, a gentleman who has filled a position of importance in one of the medical colleges in India, where he has made for himself a high reputation as a professor of medicine, a practised teacher in full possession of those powers of exposition which are rarely to be found in men who have not been in

positions where alone such powers can be acquired and cultivated.

“And now, gentlemen, not to prolong a parting scene which is painful to me, and cannot I believe be pleasant to you, let me thank you for the courtesy with which you have, one and all, invariably listened to me, and accepted my anxious efforts to do my duty in fitting you for your responsible duties ; let me wish you God-speed, and with my warmest wishes for your future health, happiness, usefulness, and honour, bid you, so far as my position as a teacher is concerned, a long farewell.”



APPENDIX

DR. WARBURG'S TINCTURE

- ℞ Aloes (Socotr.) libram.
- Rad. Rhei (East India).
- Sem. Angelicæ.
- Confect. Damocratis ; ana uncias quatuor (of the London Pharmacopœia of 1746).
- Rad. Helenii (s. Enulæ).
- Croci sativi.
- Sem. Foeniculi.
- Cretæ præparat, ana uncias duas.
- Rad. Gentianæ.
- Rad. Fedoariæ.
- Pep. Cubeb.
- Myrrh. elect.
- Camphor.
- Bolet. Larcis ana unciam.

The above ingredients are to be digested with 500 ounces proof spirit in a water-bath for twelve hours, then expressed, and 10 ounces of disulphate of quinine added ; the mixture to be replaced in the water-bath till all be dissolved. The liquor, when cool, is to be filtered, and is then fit for use.

MARTIN'S ACID BATH

Pure concentrated hydrochloric acid by measure 3 parts.

Strong nitric acid 2 parts.

Mix the two acids carefully and slowly, so as to avoid evolution of heat. After 20 minutes add distilled water 5 parts, and mix the whole carefully.

For a foot or sponging bath, 6 ounces of the above acid mixture is to be added to 2 gallons of water at 98° or 100° F., and well mixed.

FORMULA FOR THE DIARRHŒA MIXTURE
IN THE "FIELD COMPANION"

℞ Ol. Anisi.
Ol. Cajeput.
Ol. Juniperi aa ℥ss.
Ætheris ℥ss. 14
Liquor Acid Halleri ℥ss.
Tinc. Cinnam ad ℥ii.

Dose—Ten drops every quarter of an hour in a tablespoonful of water.

Shake the bottle before pouring out each dose.





