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BY
REYNOLD WEBB WILCOX, M.A., M.D., LL.D.

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TO
THE MEMORY OF
MY GRANDFATHER,
REYNOLD WEBB, M. D.,
AND MY UNCLE,
DANIEL MEIGS WEBB, A. M.; M. D.,
THIS VOLUME IS DEDICATED



Del

PREFACE TO THE THIRD EDITION.

TWENTY-FIVE years' experience in teaching more than eleven thousand medical graduates has impressed upon the author that the practitioner desires especially the latest views upon questions of diagnosis and methods of treatment. Under the influence of Post Graduate Schools the medical student is more thoroughly grounded in diagnosis, and particularly in physical diagnosis, than formerly. There still remains an anxious endeavor on the part of the physician to increase his knowledge of therapeutics, whether physical, medicinal or dietetic, which goes to make up what may be termed the management of a patient suffering from disease. While ætiology is important, pathology is interesting, and a sound basis for scientific medicine, and diagnosis is absolutely essential, it is from a thorough and broad knowledge of therapeutics in its larger sense that the practitioner will achieve his greatest success and win his most enduring reputation among his patients and the public at large. The therapeutic awakening which is now being experienced shows that more to-day, than ever before, is expected of the clinician. With the practical needs of the physician always in view, this book has been written. This edition represents careful and thorough revision of its predecessor with substantial additions, including the more recent methods of diagnosis, and especially the therapeutic resources at the command of the practitioner. Forty-three sections devoted to as many diseases have been added. These are: Brill's Disease, Posterior Basal Meningitis, Erythema Infectiosum, Carbon Monoxide Poisoning, Catarrhal Stomatitis, Riga's Disease, Baelz's Disease, Vincent's Angina, Chronic Catarrhal Pharyngitis, Chronic Tonsillitis, Ulcer of the Œsophagus, Diarrhœa Chylosa, Stercoral Ulcer of the Intestine, Chronic Universal Perihepatitis, Pigmentary Cirrhosis of Hæmatochromatosis, Hypertrophic Biliary Cirrhosis of the Liver, Obstructive Biliary Jaundice, Chronic Catarrhal Cholecystitis, Pancreatic Hæmorrhage, Diseases of Parathyroid Glands, Infantilism, Neoplasms of the Pituitary Gland, Progeria, Syphilis of the Myocardium, Acute Aortitis, Anomalies of the Aorta including Coarctation and Hypoplasia, Syphilitic Laryngitis, Chylothorax, Acute Cystitis, Chronic Cystitis, Neoplasms of the Bladder, Stone in the Bladder, Neuroses of the Bladder, Neuromata, Herpes Zoster, Psychasthenia, Intermittent Claudication, Milroy's Disease, Amaurotic Family Idiocy, Fragilitas Ossium, and Achondroplasia. Besides these.

additional matter in the text has necessitated the insertion of more than nine hundred titles in the index. The author, appreciating the favorable reception which this work has already received, has earnestly endeavored that this edition shall merit a continuance of the approval of his fellow-workers in the field of Internal Medicine. To Doctor Henry Hubbard Pelton, Adjunct Assistant Attending Physician to Bellevue Hospital and Chief of the Medical Clinic, Presbyterian Hospital, Out-patient Department, who has diligently collected his lectures, filled the *lacunæ* inseparable to clinical teaching, and has borne the labor of proof-reading and index-making, the author would tender his heart-felt acknowledgment of his varied and valuable services.



1 Epidemic Typhus Fever
Endemic Typhus Fever
Synonym: Brill's Disease

Manual for the
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USA

for Tropical Diseases
2d

Julius Announcements
p. 113

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VOLUME III. Diseases of the Digestive System—Diseases of the Urinary System.

VOLUME IV. Diseases of the Circulatory System—Diseases of the Blood—Diseases of the Ductless Glands—Diseases of Obscure Causation.

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INTRODUCTION.

In a treatise upon Practical Medicine the classification of the various diseases is to be undertaken with circumspection, for the progress which is daily taking place in the study of pathologic states is continually rendering it necessary for us to change our opinions of the nature of morbid conditions. Theories which have been credited as facts are frequently being controverted or are becoming hypotheses while apparently established facts may be overthrown to give place to their successors. As an instance, pneumonia and acute articular rheumatism are now regarded as infectious while previously the former was classed with diseases of the lungs and the latter with morbid conditions of the joints. It is not at all improbable that soon we shall be considering certain affections, now classed as splenic, as diseases of the blood, and *vice versa*, and other changes in classification are quite as possible. Hence the difficulty of arranging a given list of diseases in a manner which shall not be subject to criticism. On the other hand, it matters little under what heading a disease is considered, for the various organs and bodily systems are so intimately related that an affection of one of these can hardly exist as a distinct entity. In almost every instance associated morbid processes are taking place in other structures which have a definite bearing upon the primary state.

For this reason the present-day tendency toward specialism in internal medicine is to be decried and a reversion to the type of physician commonly designated as the "General Practitioner" advocated. It is such a medical man who, when confronted by a difficult problem, will grasp the moment when the aid of the surgeon or that of another worker in a special field is necessary; and this consultant will continue the work properly begun by the practitioner and carry it to a successful conclusion which shall be quite as much a result of the skill of the one as that of the other. The tendency of the specialist is to attribute the symptoms to some lesion of the organ or system in which he is interested, forgetting, perhaps, that other organs exist; thus the gastrologist loses sight of the possibility that the stomach symptoms of a patient, to ascertain the reasons for which the resources of chemistry are exhausted, may be an evidence of a beginning tuberculous process at a pulmonary apex and are not due to some disorder of the gastric motility or to a secretory abnormality of the glands of the stomach. Likewise the specialist upon thoracic diseases must not neglect, nor be unable to treat intelligently, the renal condition associated with a given instance of pulmonary emphysema or aortic obstruction, and the clinician who devotes himself exclusively to the subject of acute diseases should recollect the extreme

probability of the occurrence of cardiac involvement when treating a patient afflicted with acute polyarthritis. Numerous instances might be cited showing the intimate relation of the diseases of one system to those of others, but these will suffice.

In eliciting a patient's history the importance of the consideration of heredity lies less in the possibility of the direct transmission of disease than in that of the inheritance of a constitution predisposed to morbid affections by reason of its inherited vitiated powers of resistance. Not only may such a diminished resistance to disease be handed down from father to child but there is a definite possibility that the offspring of physically strong forbears may possess an increased resistance to disease which may account for some of the instances of apparent natural immunity which are observed. In considering the ailments from which an individual has previously suffered we must not lose sight of the fact that these may have a material bearing upon the disease which now brings him to the physician, in obtaining the history of which we must revert to the first noticed symptom, and its character. The associated manifestations must then be ascertained until we are able to learn which organ is chiefly affected and the others which are probably involved in consequence. Having elicited the patient's history, we should proceed to the physical examination, and this being accomplished we are finally ready to make the diagnosis. Here it is a well-recognized fact that, in every instance, we must proceed by a process of exclusion, all the possibilities being ruled out one by one until the correct diagnosis is established.

After diagnosis, treatment is to be considered and, while not underrating the value of pathological knowledge nor decrying the importance of ætiology or history, and without ignoring the advantage of expert physical diagnosis or minimizing the weight of trained and logical reasoning or depreciating the assumption of conclusions based on long-continued experience—all of which are necessary for a correct diagnosis—we must insist that learning and experience are in greatest demand in deciding upon the treatment to be prescribed. This is, to the mind of the patient, the most important consideration, for to him history and diagnosis are merely subsidiaries; his object in consulting the physician being less to learn the character of his ailment than to obtain relief.

In formulating a method of treatment for a given affection the various therapeutic measures at our disposal must be considered separately, and, more than all, in prescribing for our patient we must not use the diagnosis as a figurative peg upon which to hang a varied series of methods of treatment selected haphazard, but we should, remembering the while that most important and very definite entity, the personal equation, treat the patient and not his disease.

With a view toward systematizing and correlating our knowledge careful records of all patients should be kept and the following method of recording histories, physical examinations, and other data is suggested.

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CASE RECORD:

Record data below:

NAME—AGE—OCCUPATION—SOCIAL CONDITION—BIRTH-PLACE—PLACE OF RESIDENCE—DATE OF EXAMINATION.

HISTORY.—Hereditary Tendencies—Notable Habits—General Surroundings—Previous Illness and Accidents—Causes, Manner of Attack, Duration, and Course of Present Illness.

SYMPTOMS:

Alimentary System.—Deglutition—Appetite—Sensations during Fasting and after Eating (*Discomfort—Pain—Weight—Distention—Faintness—Nausea*)—Acidity—Flatulence—Eructation—Pyrosis—Vomiting. State of Bowels (*Frequency—Color of Stools—Tenesmus*).

Circulatory System.—Subjective Phenomena (*Pain—Palpitation—Faintness—Dyspnœa*).

Respiratory System.—Breathing (*Painfulness*)—Cough—Larynx (*Pain—Difficulty of Speech*).

Integumentary System.—Subjective Phenomena — Skin (*Dryness — Itching — Moisture*).

Urinary System.—Subjective Phenomena (*Pain in Loins, Bladder or Urethra*)—Micturition (*Frequency—Pain*).

Reproductive System.—MALE—Abnormal Discharges—Functions—Subjective Phenomena. FEMALE—Catamenia—Pregnancies—Abnormal Discharges—Subjective Phenomena.

Nervous System.

Sensory Functions.—Sensations (*Pain—Heat—Cold—Formication—Numbness—Tingling—Girdle Pain—Vertigo*).

Motor Functions.—Organic Reflex (*Swallowing—Breathing—Micturition—Defecation*).

Vasomotor and Trophic Functions.—Subjective Phenomena.

Cerebral and Mental Functions.—Subjective Phenomena—Sleep.

Locomotor System.—Subjective Phenomena.

SIGNS:

Record data below:

STATUS PRÆSENS.

General Facts.—Height—Weight—General Appearance (*Temperament—Attitude and Expression*)—Temperature.

Alimentary System.—Lips—Teeth—Gums—Tongue—Fauces—(*Characters, Macroscopic and Microscopic, of Vomited Matters*)—Character of Fæces—(*Macroscopic and Microscopic Examination*)—Abdomen (*Prominence—Retraction—Distention—Flaccidity—Tenderness—Fluctuation—Outline of Normal or Abnormal Contents*)—Röntgen-ray Examination.

Hæmopoietic System.—Lymphatic Vessels and Glands—Ductless Glands (*Spleen—Thyroid*)—Microscopical Characters of Blood—Hæmoglobin Percentage—Specific Gravity—Coagulation Time—Cryoscopic Examination.

Circulatory System.—Inspection (*Form and Appearance of Precordium*)—Palpation (*Position and Character of Cardiac Impulse*)—Percussion (*Superficial and Deep Outline*)—Auscultation (*Rhythm and Quality of Sounds in Mitral, Tricuspid, Aortic and Pulmonic Areas, and over General Surface of Heart and Main Vessels*)—Pulse (*Frequency—Force—Rhythm—Character—Sphygmographic Tracings*)—Arteries, Veins and Capillaries—Röntgen-ray Examination—Blood Pressure Estimation.

Respiratory System.—Breathing (*Frequency—Rhythm—Type*)—Sputa (*Macroscopic and Microscopic Characters*)—Nares (*Rhinoscopic Examination*)—Pharynx—Larynx—(*Voice—Tenderness—Laryngoscopic Examination*)—Inspection (*Form and Action of Thorax*)—Mensuration (*Spirometric Tests*)—Palpation (*Vocal Fremitus*)—Percussion (*Anterior and Posterior, on both sides*)—Auscultation (*Determination, during Natural and Deep Respiration, of the Duration of the Sounds, their Character, Accompaniments, and of the Vocal Resonance—Tussive Signs*)—Röntgen-ray Examination.

SIGNS (Continued):

Record data below:

Integumentary System. — Obesity — Emaciation — Edema — Emphysema — Eruptions (*Distribution—Elements of Skin Involved—Type—Cause*).

Urinary System. — Urine — Quantity — Color — Specific Gravity — Chemical Reactions (*Acidity — Alkalinity — Albumin — Sugar — Acetone bodies — Urobilin — Indican—Amount of Urea—Uric Acid—Chlorides—Phosphates.*) — Sediment (*Macroscopic and Microscopic Characters*) — Cryoscopic Examination — Röntgen-ray Examination.

Reproductive System. — MALE — Testicle — Epididymis — Prostate — Urethra (*Endoscopic Examination*)—Bladder (*Cystoscopic Examination and Result of Ureteral Catheterization*) — Abnormal Discharges. FEMALE — Ovaries — Tubes — Pelvic Cavity—Uterus—Vagina (*Examination with Speculum*)—Urethra (*Endoscopic Examination*)—Bladder (*Cystoscopic Examination and Result of Ureteral Catheterization*)—Abnormal Discharges.

Nervous System.

Sensory Functions.—Sensibility to Touch (*Æsthesiometric Examination*) — Heat — Tickling — Pain — Muscular Sense — Sight (*Ophthalmoscopic Examination*) — Hearing (*Otoscopic and Horologic Examination*) — Taste — Smell.

Motor Functions. — Skin Reflex — Tendon Reflex—Voluntary (*Systematic Examination of Muscles*)—Co-ordination—Electric Irritability (*Faradic, Galvanic*).

Vasomotor and Trophic Functions.—(*Congestion — Pallor — Edema — Inflammation — Sloughing—Wasting—Perspiration.*)

Cerebral and Mental Functions.—Intelligence (*Hallucinations — Illusions — Delusions — Delirium — Torpor — Coma — Coma-Vigil*) — Attention — Memory — Emotion — Speech — (*Comprehension of Language, heard, seen — Utterance of Language, spoken, written*)—Röntgen-ray Examination.

Locomotor System — Bones — Joints (*Pain — Swelling — Effusion — Mobility—Röntgen-ray Examination*)—Muscles (*Rigidity — Flaccidity — Cramp — Twitching, general or fibrillary—Hypertrophy—Atrophy — Dynamometric Examination*).

DIAGNOSIS.

Subsequent History:

PROGNOSIS:

TREATMENT:

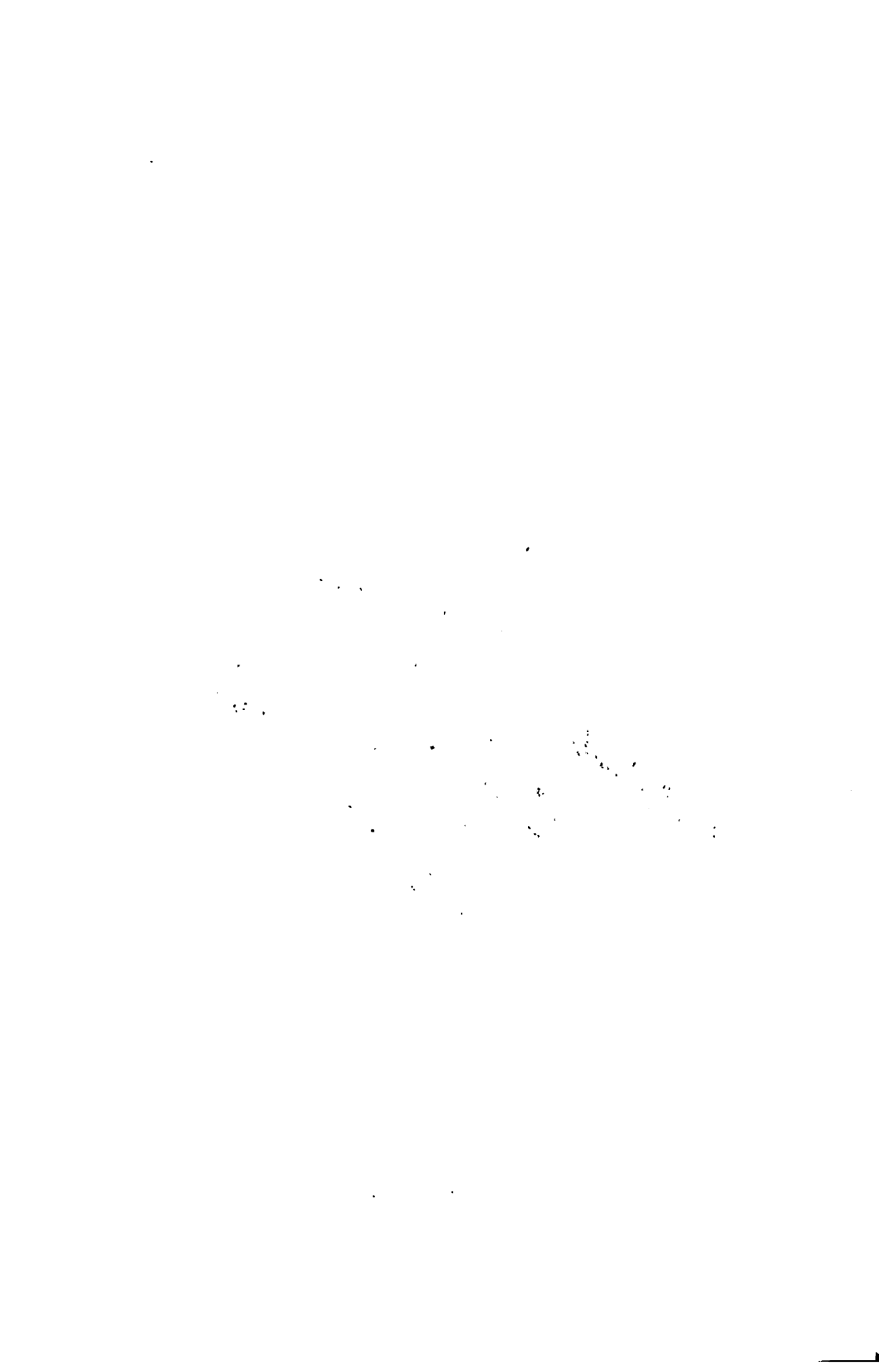
Medicinal:

Physical: (Electricity, massage, hydrotherapy, etc).

Dietetic:

Hygienic:

General Directions:



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PRACTICAL MEDICINE.

CHAPTER I.

INFECTIOUS DISEASES.

ENTERIC FEVER.

Synonyms. Typhoid Fever; Typhus Abdominalis; Gastro-enteric Fever; Nervous Fever.

Definition. Enteric fever is an acute infectious febrile disease characterized by inflammation and ulceration of the Peyer's patches or lymph follicles of the intestine, by swelling and inflammation of the mesenteric glands, enlargement of the spleen, and a petechial eruption.

Ætiology. The specific cause of enteric fever is the *bacillus typhosus* of Eberth-Gaffky. This bacillus is to be found in the stools, the urine, the blood, the lymph patches of the intestines, the lymph glands, the spleen, the skin eruption, and in the marrow and various organs. It usually enters the organism in infected water or milk, or upon contaminated food; such as oysters which have been bedded near sewer exits, or green vegetables which have been fertilized by means of sewage. It is contended by some that the bacillus is air-borne and may enter the respiratory system and thus reach the blood. Sewage to be contaminated by the bacillus must have received either directly or indirectly the discharges from a patient suffering from the disease. Even after apparent recovery the discharge from the bowels and bladder are capable of transmitting the disease. The occasional discovery of a "typhoid carrier" suggests an origin of instances of this disease probably more frequent than has hitherto been suspected.

Enteric fever is more common in the young adult than in childhood, middle or old age, and seems to attack the vigorous and healthy as often as the weak and enfeebled. Men seem more susceptible than women, but this is probably because they are more liable to exposure. The disease is most frequently seen in the late summer and early autumn and may occur in almost any climate. It is commonly endemic, but epidemics occur at intervals. One who has once had the disease seldom suffers from a second attack.

Pathology. The most characteristic lesion of enteric fever is the inflammation of the solitary and agminated glands of the small intestine. These glands are first congested and swollen, later they disintegrate and necrose,

and the formation of ulcers takes place. When a solitary gland is involved the ulcer is small and round; in the agminated glands it is oval with its long diameter parallel to the long axis of the intestine. The borders of the ulcers are raised; their bases, which may consist of the submucosa, the muscular coat of the bowel, or of the peritonæum, are necrotic. The ulcer may erode all the coats of the bowel and the peritonæum, and perforation may take place, local or general peritonitis resulting. More usually, fortunately, the ulcer gradually heals, but the return of the glandular tissue to normal does not take place and permanent scars remain. In a considerable number of the patients the large intestine is involved as also may be the appendix. In either of these situations perforation may occur.

Inflammation of the mesenteric lymphatic glands and of the spleen is likely to occur, resulting in increase in the size of these structures. The spleen is usually palpable and may be enlarged to two or three times its normal size. Abscesses have been reported.

Thromboses of the veins may occur, especially of those of the leg. Arterial thrombosis is rare. The pericardium, myocardium, or endocardium may be the seat of inflammation due to the infection.

Respiratory lesions, such as inflammations of the larynx, bronchi, or pleura, are not infrequent. Empyema is rare.

The liver is the seat of an acute degeneration, with granular, and at times fatty, changes in its cells. Abscesses may occur. The bacillus has been found in the gall-bladder and a typhoid cholecystitis may occur.

The kidneys also undergo an acute degeneration in their parenchyma; rarely there may be an acute nephritis. Abscesses of the kidney are rare. Pyelitis and cystitis may complicate the disease.

Lesions in the nervous system are infrequent, but meningitis has been observed as also has cerebral abscess. The typhoid spine is comparatively rare.

Abscesses in various parts of the body, notably under the periosteum and in the parotid gland, are not uncommon.

Symptoms. The incubation period is usually about two weeks, and may be accompanied by lassitude and lack of appetite. Occasionally the patient may continue up and about after the onset of the disease (walking typhoid). The inception of enteric fever is gradual, with headache, general bodily pains, nausea and vomiting, and a rise of temperature. Chilly feelings may occur, but a distinct chill is rare. There may be nose-bleed and slight bronchitis, evidenced by cough. In children the onset is more usually acute. The bowels may be loose or constipated. There may be abdominal tenderness and distention. About the eighth day the eruption, consisting of small, isolated, rose-colored, slightly elevated round or oval spots of about two to four millimeters in diameter, appears. These disappear on pressure but reappear when the pressure is removed. They are seen earliest upon the

back and loins, and later upon the chest and abdomen. They may be found upon the arms and thighs, but very rarely upon the forearms and legs. They appear in successive crops, each crop lasting two to four days, while the eruptive period lasts from two to twenty days. Relapses show a fresh eruption and the spots may appear during convalescence.

The course of the disease usually lasts about four weeks and to each week belong certain symptoms.

The typical temperature of enteric fever is as follows: After the chill on the onset the temperature rises and during the week following it is high at night

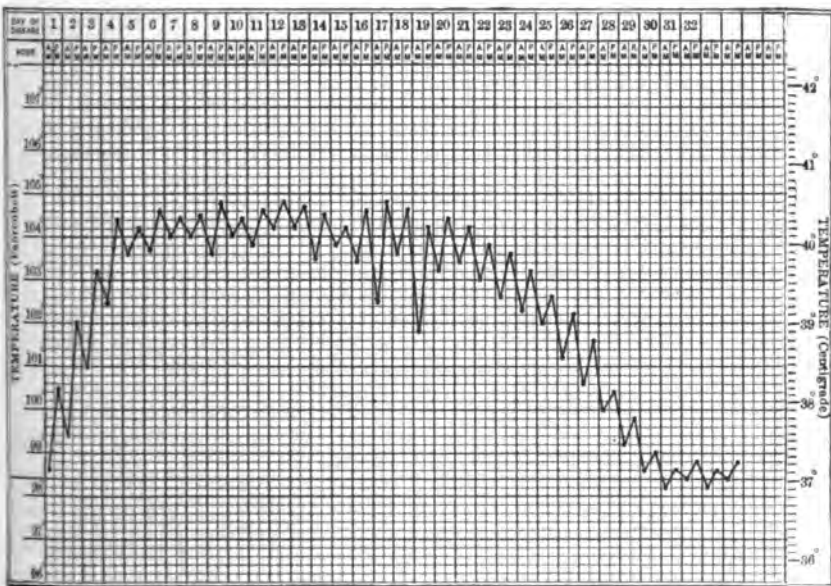


FIG. 1.—Clinical chart of enteric fever of four weeks' duration without complications and showing the temperature as uninfluenced by baths or other treatment.

and lower in the morning, but day by day the differences between these temperatures become less. During the second week the temperature is continuously high and there is little difference between that of the morning and that of the evening. In the third week the morning temperature becomes lower while that of the evening remains as high as during the second week. The typical fourth week temperature is one in which the morning temperature falls gradually lower and that of the evening does likewise, dropping to a lower level each day until both it and the morning temperature reach normal.

Complications may alter the course of the temperature. Intestinal hæmorrhages are usually followed by a rapid and distinct fall. The height of the

temperature is commonly in direct proportion to the severity of the infection, and usually in fatal instances, unless death results from one of the complications above mentioned, the temperature remains high until death takes place; infrequently, however, death may supervene without the temperature ever having reached a very high level.

The pulse usually bears a direct relation to the temperature curve. In the first week it is full, tense, and strong, and from ninety to one hundred beats per minute; during the second week, especially in severe infections, it is likely to become rapid, feeble, and possibly dicrotic.

Various departures from the typical temperature are not rare. When the disease begins with a chill the temperature may rise at once as high as 103° F. or 104° F. (39.5° or 40° C.). Not infrequently does defervescence take place at the end of the second week and the temperature fall to normal within twenty-four hours. A temperature higher in the morning and lower in the evening may occur but has no especial significance. Sudden falls in temperature usually indicate an intestinal hæmorrhage or perforation. Hyperpyrexia is rare but may be observed just before death. Chills may occur, as stated, at the onset of the disease; at intervals during its progress; with the incidence of complications; after the use of antipyretic drugs or of baths; or during convalescence with no assignable cause.

The chills may be accompanied by sweating, but profuse diaphoresis is rare, though at times the abdomen and chest may be moist, especially during the reaction from a bath.

Rises of temperature after defervescence (recrudescences) may take place even after there has been no febrile movement for several days. These may continue for a number of days and then cease. Accompanying them there is no constitutional disturbance, but they call for increased vigilance on the part of the physician. They are usually the result of improper feeding, constipation, or mental excitement.

Certain patients in whom convalescence has apparently become established continue to show an evening rise of temperature of one or two degrees (F.). This may be due to starvation but should cause the physician to search for complications, particularly abscesses. In excessively nervous patients such an evening rise is frequent, but if no other symptoms are manifest it may be disregarded and it often disappears if the patient is allowed to sit up, is given small amounts of solid food, and the use of the thermometer is discontinued.

Relapses, which may be repeated, are due to a fresh infection with the *bacillus typhosus* or to other bacilli, alike in species but not identical with it, which have preserved their pathogenic potency, and last varying periods of time, as a rule, they are shorter in course than the original attack. The temperature rises and is accompanied by a return of the symptoms and declines gradually.

Afebrile enteric fever has been described by certain observers but is apparently of rare occurrence.

The facial appearance of enteric fever has been described as typical. Early in the disease the face is flushed and the eyes are bright; by the beginning of the second week the expression becomes apathetic and at the height of the disease it is dull and listless—the typhoid facies. The lips and cheeks may retain a good color throughout the disease.

The typhoid tongue is at first moist with a white coat down its center; its edges and tip are red. In mild infections the tongue continues moist, but in severe types of the disease it becomes dry, brown, cracked and glazed in the later weeks. Sordes may make its appearance. As convalescence progresses the tongue gradually assumes its normal condition.

The spleen is regularly enlarged, soft, generally readily outlined by percussion and usually may be palpated without difficulty.

Unusual Modes of Onset. (a) Ambulatory or walking enteric fever: In this type of the disease the patient remains up and attempts to go about his usual occupation. He realizes that he is not in perfect health but feels hardly ill enough to go to bed. When he is first seen by the physician he may have a high fever and a well-developed rash. These infections often prove severe because of lack of proper treatment in the early stages.

(b) With marked gastro-intestinal symptoms: The nausea may be severe and the vomiting almost continuous and very difficult to control. Profuse diarrhoea may be present.

(c) The usual cough accompanying the onset may be much accentuated and the chill and pain in the side of such character as to suggest pneumonia.

(d) With symptoms referable to the kidneys: Rarely we may observe an onset distinguished by bloody urine containing albumin and casts.

(e) With pronounced nervous symptoms: Agonizing and obstinate headache or facial neuralgia may be initial symptoms. In certain instances when the patient has continued about during the early weeks, delirium may be the first marked symptom. Rarely the disease may begin with muscular twitchings or convulsions, stiffness of the neck, and photophobia. Drowsiness, apathy, and stupor may exist for some days before other and more typical symptoms develop. Very infrequently is mania the first symptom. In alcoholic patients the various nervous manifestations are especially marked.

(f) Intestinal hæmorrhage or perforation may rarely occur as symptoms of onset.

Each week of the course of enteric fever in a typical instance is marked by a special set of symptoms. During the incubation period—varying from ten to twenty-one days, usually about two weeks—the patient suffers from indefinite malaise, nausea, headache, and general soreness.

First Week. The invasion of the disease is marked by chilly feelings,

more rarely by a distinct chill, severe frontal headache, and pains in back and limbs; the tongue is coated down its center, its edges and tip are redder and the papillæ more prominent than normal. There often is spontaneous nose-bleed and there is likely to be cough due to slight laryngitis or bronchitis. The eyes are suffused. The patient is thirsty and often conscious that his temperature is elevated. He complains of weariness, insomnia, and nausea which is often accompanied by vomiting. Constipation is the rule, but diarrhœa may be present. There may be sore throat with discomfort on deglutition. During this stage of the infection the patient may continue up and about, but usually he finds that he is more comfortable in bed. The course of temperature has been described; by the fifth or sixth day it reaches an evening elevation of 103° to 103.5° F. (39.5° to 39.8° C.). The pulse is rapid, strong, and tense, ninety to one hundred beats per minute. Very rarely is it dicrotic. By the end of the week the typical enteric facies is evident. A few rose spots may be seen and the spleen may be palpable.

Second Week. As the second week progresses all the symptoms become more marked with the exception of the headache and other pains and the nausea and vomiting; these usually cease. The temperature continues high (103° to 104° F.)—(39.5° to 40° C.) with slight morning remissions. The pulse becomes softer, feebler and more rapid (one hundred to one hundred and twenty). Bodily weakness is pronounced. The tongue is dry, brown and tremulous; there is likely to be diarrhœa, three to five thin, pale, yellowish-brown movements a day (pea-soup stools). Mild delirium may appear late in this week; at first it is present only at night, later it lasts through the day as well and the patient shows other effects of the toxin of the disease upon the nervous system, such as photophobia, slight deafness and muscular twitchings. If there is no delirium the patient lies in a lethargic condition, takes no interest in his surroundings and makes no requests.

Third Week. The symptoms of the second week continue and become more pronounced. The temperature continues high, but as the week nears its close, the morning temperature is likely to fall to a lower level (101° to 102° F.) (38.4° to 38.8° C.). The pulse may become very rapid and weak and dicrotism may be manifest. The tongue becomes more dry and cracked and the patient may be unable to protrude it. Bed sores may appear and retention of urine and incontinence of fæces may occur. The symptoms of cerebral poisoning become more marked, the muscular twitchings (*subsultus tendinum*) are more noticeable and the patient may pick at the bed coverings or grasp at imaginary objects. Intestinal hæmorrhage may be evidenced by blood-tinged stools or blood in considerable quantity may flow from the rectum, leaving the patient in collapse with a sudden fall in temperature, imperceptible pulse and other symptoms of extreme weakness. Pulmonary congestion or pneumonia may complicate the disease during this week. Meteorism is not rare. The patient may die or continue to the next week.

Fourth Week. Now the morning temperature falls still lower and the evening rise gradually becomes less until the former reaches normal and the latter (101° to 102° F.) (38.4° to 38.8° C.). As the temperature diminishes the other symptoms gradually ameliorate, the tongue loses its dry, cracked appearance and becomes moist, the pulse is stronger, the nervous manifestations disappear, and the appetite becomes more vigorous.

Fifth Week. The patient may immediately proceed to complete recovery, the febrile movement may last two or three weeks longer, or after a normal temperature lasting several days, a relapse may take place.

Convalescence is slow. The patient is extremely weak although he may feel well and be very hungry. He is able to sit up but for a few moments at a time and walking is quite impossible. Relapses may be brought on by errors in diet or by over-exertion. The patient often loses his hair for a time and it usually is a number of months before full strength is recovered. Dysmenorrhœa is a common sequel in women.

Menstruation usually takes place as in health during the first or second week, but later and in convalescence it may be absent. Pregnant women, though they seldom contract the disease, often abort during its course.

Complications. *Thrombosis* of the veins, more particularly of the left femoral—although it may occur in both femoral veins—takes place in about one percent. of all instances. Recovery is the rule unless emboli dislodged from the clot find their way to the heart, in which case sudden death takes place. There is usually phlebitis of greater or less extent as well as thrombosis, and arterial thrombosis is a possible occurrence. The *bacillus typhosus* has been found in the thrombi.

Hæmorrhage from the bowel is a serious complication and is the result of the erosion of a vessel wall by the ulcerative process. It is said to occur in about five percent. of the cases. It is by no means necessarily fatal, recovery having taken place after the loss of large quantities of blood *per rectum*. Such a hæmorrhage is evidenced by rapid fall of temperature, pallor, coldness of the extremities and other symptoms of collapse.

Perforation is also marked by a sudden fall in temperature as well as by severe abdominal pain and symptoms of collapse. The pain is rarely localized but is usually general over the whole abdomen. This is a markedly fatal complication, the only chance for recovery being immediate surgical interference; otherwise general peritonitis results.

Peritonitis without perforation may occur by extension of the inflammation within the intestine to the peritonæum surrounding it. It is a grave, though not necessarily fatal complication. When recovered from it is likely to leave bands of adhesions which may later cause serious complications.

Parotitis followed by suppuration is rare. The infection reaches the gland by means of Stensen's duct.

Cancrum oris may complicate or follow the disease in children. Gangrene of other parts may occur but is rare.

Pneumonia due either to the *bacillus typhosus* or the pneumococcus may occur either early or late in the disease. In the later weeks hypostatic pneumonia may complicate the course of the infection.

Suppuration in various parts of the body as a result of enteric infection is not rare. The most common situations are the middle ear, the periosteum, the urinary bladder and the gall-bladder. Furunculosis is not uncommon. The pus of these lesions usually contains the *bacillus typhosus*.

Ostitis and perichondritis are common. These may result in necrosis.

Typhoid spine is a rare complication and is the result, in all probability, of an inflammation in and around the bodies of the vertebræ.

Cholelithiasis as a sequel of typhoid fever is well-recognized. It is probably the result of changes in the gall-bladder or in the biliary secretion due to the presence of the *bacillus typhosus* and which facilitates the formation of calculi.

Neuritis is fairly common and may occur during the course of the disease or in convalescence. Its onset is marked by great tenderness along the course of the affected nerves. There may be a slight degree of paralysis, usually involving the extensor muscles of the limbs and evidenced by wrist and foot-drop.

Endocarditis, pericarditis and pleuritis are infrequent complications.

Bed sores may develop in severe instances and in those not well cared for. They are a dangerous and unnecessary complication.

The Blood. During the course of enteric fever the red blood cells and hæmoglobin are diminished; during the early weeks the diminution is gradual. As the temperature becomes normal this diminution takes place more rapidly. The red corpuscles are usually fewest when convalescence begins and as recovery progresses they increase in number. The hæmoglobin percentage is usually lower than the number of red cells would lead us to expect and it increases more slowly than does the number of erythrocytes.

The leukocytes early in the disease show a diminution, in a very large percentage of patients they are less than seven thousand per cu.mm. Non-typhoid complications do not seem to diminish this tendency to hypoleukocytosis. Hæmorrhage and perforation are followed by an increase in the white cells. It may be considered that a leukocyte count above twelve thousand at the beginning of an illness is strong evidence against enteric fever. The leukocytes diminish as the disease progresses, reaching the minimum at the termination of the febrile movement, and, as convalescence is established, beginning to increase again.

Cold baths seem to temporarily increase the number of leukocytes but this is believed to be due to a tendency upon their part to seek the surface capillaries rather than a true leukocytosis. A sudden increase in the num.

Surgical complications

Ogilvy

Postgraduate July 1911

umbilical reflex in
Dysentery, typhoid
Herman C. Gindler
albany medical journal
1915 Vol 36 p. 432

Dysentery
Cultures blood
urine
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ber of leukocytes is considered to be a warning of threatened peritonitis or perforation. In complicating suppurative conditions there is, as one would expect, a leukocytosis.

Diagnosis. During the disease the blood contains the *bacillus typhosus* and this organism may be cultivated from it.

The Widal reaction is based upon the fact that the blood-serum of persons suffering from enteric fever possesses the property of arresting the motion of and agglutinating the causative germ. This reaction exists in over ninety percent. of cases and is a valuable diagnostic aid. It is seldom observed before the patient has been ill enough to have been in bed for a week. At times the reaction is not present until after the establishment of convalescence. If it is not obtained upon the first attempt, others should be made at intervals. The reaction may disappear after the cessation of the pyrexia or it frequently persists for months or even years.

The urine in enteric fever is dark in color, high in acidity and specific gravity, and may contain albumin and casts. The *bacillus typhosus*, in a large percentage of patients, is present in the urine, appearing therein usually in the second or third week and persisting into the period of convalescence and even after the patient is apparently cured, this organism probably being propagated in the bladder. Its presence is of no importance in prognosis, but is a source of infection which is not generally recognized.

Ehrlich's diazo-reaction is so often present in the urine of enteric fever that its aid in diagnosis should always be invoked. It is not pathognomonic, since it may occur in other conditions. It is usually present early in the infection. A careful observation of the symptoms together with the tests described lead to a diagnosis of enteric fever as distinct from other diseases in which so-called typhoid symptoms supervene. There is, however, a rare disease which presents the symptoms of typhoid fever, to which are added those of pneumonia, due to an infection from diseased parrots, known as psittacosis, the bacillus of which prepares the way for various secondary infections, pneumococcus, streptococcus, colon bacillus and other organisms. Even here specific agglutination and blood culture will establish the diagnosis.

Prophylaxis. The prevention of enteric fever resolves itself primarily into the destruction of the specific bacillus, or failing this, the prevention of its entrance into the human body. All excreta, fæces, urine, pus from abscesses, etc., as well as all bed clothing, bath waters and all utensils which have in any way come into contact with the patient should be properly disinfected or disposed of in other ways.

The fæces should be discharged into glass or porcelain vessels and must be thoroughly macerated and allowed to stand for at least one hour mixed with a freshly prepared disinfecting solution such as lime chloride, four ounces, to water, one gallon. The urine should stand for ten minutes mixed with one-tenth of its volume of mercury bichloride one to one thousand.

Sputum should be expectorated into vessels containing phenol one to ten, or the lime solution given above. Bath water and remnants of food should be disinfected with lime or phenol solution. Bed linen and clothing, before being sent to the laundry, should be immersed in a solution of phenol three to one hundred, or boiled in soapsuds to which washing soda has been added. Pus infected dressings and the like should be burned.

The sick-room should be disinfected in the manner customary after the infectious diseases.

Since the *bacillus typhosus* usually enters the body by way of the mouth too great care cannot be taken to be certain that all ingested substances are above suspicion.

The specific bacillus of enteric fever being excreted in the urine naturally necessitates the thorough disinfection of this fluid as is suggested in a previous paragraph. An additional safeguard in this connection is the administration of hexamethylenamine (urotropin) in doses of seven grains (0.5) three times daily. This drug is believed to render the urine sterile since it is excreted in this fluid as formaldehyde. This means of safeguarding the public health should never be neglected; rendering the urine free from infective properties is also important from the standpoint of the patient and is not to be neglected in the treatment of the disease. The administration of the drug should be begun in the second week of the affection and should be continued for several weeks into convalescence.

^ *Anti-enteric inoculation or vaccination* has been attempted by various experimenters and the result of their observations may be summed up in the statement that the measure is one which, in properly selected cases, is fraught with little or no danger, and so far as we are able to judge, one which should not be neglected when there is probability of exposure to the infection of the disease such as occurs in armies and when an epidemic is imminent. Cultures of the *bacillus typhosus*, the bacilli having been killed, when injected into man produce a serum which probably contains both bacteriolysins and agglutinins. The method of Wright which is harmless has been extensively employed and apparently not only lessens the incidence of the disease, but diminishes the mortality of those who contract it. It is very doubtful if there is any increased susceptibility following inoculation. The immunizing dose of typhoid bacilli is from seven hundred and fifty to one thousand millions for the first inoculation and twice as much for the second. There are some local manifestations at the site of injection, erythema, more or less serous exudation with slight lymphangitis. The tendency to effusion at the point of inoculation is accounted for by the diminished coagulability of the blood which can be obviated by a dose of thirty grains (2.0) of calcium chloride given at the time of the first dose. Alcohol must be forbidden. Constitutional symptoms are chill, headache and malaise, and slight fever for twenty-four to thirty-six hours. If much larger doses are given depression

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Wiles

Antityphoid Vaccination

Am. Practitioner

Mar 1912

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Sanitary Record, the same Division

Jan. Am. Med. Assoc

Aug 26, 1911

Russell

Control of

Typhoid in the Army

by Vaccination

Ref. State Journal of

Medicine

Dec 1910

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may simulate collapse. No bad after-effects have been observed. Anti-enteric vaccination has already demonstrated its value in military practice.

Treatment. In the treatment of typhoid fever it is of the greatest importance that all patients should be strictly confined to bed during the febrile stage of the disease and well beyond this into convalescence. In a private house the bed should, when possible, be in a large, well-ventilated room from which all hangings and superfluous furniture have been removed. The temperature should not be above 60° F. (15.5° C.) and in favorable weather the windows should be open. Too bright light and too much darkness are to be avoided. The bed should not be too heavily covered, and the bed linen must be kept perfectly smooth and frequently changed. In severe infections the air or water bed may be necessary. Early in the disease dorsal decubitus is the best position, but later the patient may be encouraged to change his attitude lest there be any tendency to pulmonary hypostasis. The mouth, teeth and tongue should be frequently cleansed. Studious attention should be given to the proper cleanliness of the body and all points at which bed sores are likely to develop must receive special care. The bowels and bladder should be evacuated only when the patient is lying on his back.

Since febrile diseases actively consume the body proteid this loss must be supplied in so far as possible, by nourishing food. The fact that the digestive fluids are altered makes this a complicated problem and the pathological changes in the digestive tract add to the difficulty. During the febrile movement of typhoid fever, and usually for some time thereafter, fluid diet should be strictly enforced. If the patient has a lack of appetite the physician may combat this by careful variation of the diet in accordance with the tastes of the patient. Cold drinks need not be restricted, water, plain or with fruit juices, natural mineral waters containing not too much carbon dioxide, and cold tea may be allowed.

Milk is the most perfect food, though some patients object to it and others do not bear it well for any length of time. In such instances it may be diluted with plain water, mineral water, or lime water, or to it may be added cooked tapioca or arrowroot. If milk appears undigested in the stools too much has been administered; the quantity should be lessened and broths or beef juice should be given; buttermilk, peptonized milk, and fermented milk are often useful, although irritating curds are often formed which may give rise to serious complications. Although under the antiseptic treatment great emaciation is not met with, there has been a tendency since the time of Graves, 1835, to administer more food during the progress of the disease. The plan is suggested by Coleman of using milk, cream, milk-sugar, eggs, small pieces of stale bread or toast with as much butter as the patient desires. Milk, three pints, cream from one to two pints, one-half to one and two-thirds pounds of milk-sugar, and from three to six eggs are the daily quantities employed. If curds appear in the stools the amount of milk should be dimin-

ished or it should be peptonized. If the cream causes diarrhœa it should be stopped. If the milk-sugar causes vomiting with or without nausea it should be omitted for a few days and resumed in smaller quantities. The food is given at two-hour intervals, except that patients are not awakened at night. Cream in the proportion of one to three is added to the milk, and at the outset, in this, a tablespoonful of milk sugar is dissolved. The eggs may be given soft boiled, soft poached, or shaken up with milk, with or without whiskey. Then barley gruel and albumin water, with or without lemon juice, are allowable. Simple ice-cream made of milk with the addition of a little sugar and vanilla extract may prove acceptable. Oatmeal, boiled with water to a jelly and strained, has been strongly recommended. Often the artificial infant foods, meat broths, and bouillon are useful and well borne.

In accordance with this tendency toward a more liberal feeding, in addition to broths, it has been suggested, soups, almost any kind carefully strained and thickened with powdered rice, arrowroot, barley, wheat-flour, to which milk or cream or even an egg may be added, raw or even soft-boiled eggs or eggnog are permissible. If the condition of the patient is otherwise favorable, lean minced meat, scraped meat, soft crackers, puddings or toast, wine jellies, apple sauce, blancmange, and macaroni may be allowed. It is understood that no irritating or indigestible substances are contained in these foods.

One week after the cessation of the febrile stage the consensus of opinion is that the patient may be given solid food; at first toast, a soft egg, scraped beef, to be followed a few days later by roast fowl and purée soups. At the end of the second afebrile week, steak, chops, and green vegetables may be added. Some patients, after the acuity of the disease has subsided, continue to have an evening rise of temperature of two or three degrees (F.); to such, if the nutrition is impaired and the need of food is manifest, we may allow a gradual return to solid diet. Usually the temperature promptly subsides and no harm is done.

The specific treatment of typhoid fever by means of an antitoxin has as yet given no very favorable results. The difficulty in the preparation of an antityphoid serum is that typhoid fever, unlike diphtheria, which is merely a toxæmia, is more especially a bacteriæmia. The problem, therefore, is the production of a serum which is principally bactericidal, though it probably must be, to a certain extent, antitoxic as well.

Chantemesse, in his latest reports upon the serum treatment of this disease, claims that by the use of a serum taken from horses which have been immunized by the injection of a soluble enteric toxin he has reduced the death rate to four or five percent., as against a mortality of eighteen percent. in other hospitals in Paris where the cold bath treatment only is used. He states the interesting fact that patients profoundly poisoned by the disease should receive small doses of the serum as against the large doses given in

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mild infections. He uses cold bathing in connection with his serum and considers the prognosis under this form of treatment best when the injections are begun early in the disease.

Much experimentation has been done by various observers along the lines of serum treatment, but this apparently has resulted in the production of only a very slight influence on the disease and, as regards therapeutics, little more has been proven than that the treatment is harmless.

Although the results are hardly encouraging in the serum, as compared with the antiseptic treatment of enteric fever, yet in case of "typhoid carriers" the instances showing good effects of the anti-enteric inoculation, although few in number, yet are encouraging. In these cases the bacilli are recovered from the patient's fæces or urine, killed as for preventive inoculation, and are administered in fifty million doses; a week later the dose is doubled, at the second week again doubled, and so on until a dose of a thousand million is reached. By this time there is a complete absence of bacilli from all excretions.

Treatment by Elimination and Intestinal Antisepsis. From the time that enteric fever was recognized as a distinct disease, and more particularly since it was demonstrated to be of bacterial origin, the eliminative and antiseptic treatment has been foremost in the minds of advanced clinicians. The only questions have been, can the antiseptic treatment be efficient, and, how shall we best secure its efficiency? An extended experience shows that many patients may be treated effectively by the use of such insoluble antiseptics as naphthalene, the various preparations of salicylic acid and bismuth naphtholate or tetraiodophenolphthaleinate. Of these the two bismuth salts are to be preferred. The bowels should be first flushed with calomel followed by a saline, and then the bismuth salt should be administered in divided doses of from ninety to one hundred and twenty grains (6.0 to 8.0) per day. If the disease is not inhibited in the first week of the exhibition of these salts the problem is complicated by the fact that the infection has become systemic. We must now administer an antiseptic which will be disseminated as far as the blood goes and which can permeate every organ and tissue.

At present the administration of the compound solution of chlorine which is official in the United States Pharmacopœia, accomplishes the purpose better than that of any other drug. It should be given in doses of one drachm (4.0) every three or four hours. In such dosage it may be given until complete disinfection of the alimentary tract is obtained: not only this, but it is also taken up by the blood, as is proven by the fact that free chlorine has been found *post mortem* in the ventricles of the brain, and that it can combat the infection even there.

All of the chlorine is not changed in the stomach into alkaline chlorides, but that some passes through the intestine in its original form is proven by

the fact that its odor can be detected in the fæces. It is not irritating to the mucous membranes of the gastro-intestinal tract.

The author considers that there is nothing in medicine more striking than the clearing up of the tongue, the improved mental condition, the lessened local disturbances, and the general betterment which chlorine, administered in this form, brings about in enteric fever, and especially is it effective in the severer forms of the disease.

In concluding the discussion of the treatment by chlorine it may be safely asserted:

1. That in the treatment of enteric fever chlorine can be safely administered, without fear of digestive or other disturbances, until the alimentary tract has been completely disinfected.

2. That under its use the tongue becomes cleaner, the appetite and digestion better, the fever lower, and the stools devoid of odor save that due to the chlorine.

3. The general strength, intellectual processes, and nervous conditions improve.

4. The duration of the disease is shortened and the patient usually proceeds to a rapid and complete recovery.

The mortality should not be greater than two percent.

Complications are rare because this form of treatment limits the infection. The temperature is not sufficiently elevated after thirty-six hours of treatment to cause apprehension. Questions of feeding are not so important because (a) there is but comparatively little wasting; (b) the disease being early limited, there is a larger area for absorption, and (c) the digestive processes are not markedly interfered with.

In children it is better to begin the administration of chlorine early in the disease, no preliminary treatment by means of the insoluble intestinal antiseptics being necessary or advisable.

During the course of the disease elimination is encouraged by the use of high rectal irrigations of one gallon (4 liters) of normal (0.9 percent. sodium chloride) saline solution. The tube should be gently passed into the rectum for at least a foot, the bag or irrigator should be three feet above the patient, and the temperature of the solution 112° F. (44.5° C.). The irrigations should be given twice a day. They hasten the elimination of toxins, keep the bowels clean, and have a considerable stimulant effect upon the patient.

If constipation is present sufficient magnesium sulphate to keep the bowels freely open should be prescribed.

Treatment by Means of Cold Baths.—At the present time the treatment of enteric fever by means of the Brand, or more properly the Currie-Jürgensen bath is enjoying considerable vogue. The history of this method is a curious one. In the early period of the use of this method it was advocated because it was thought that it reduced the fever. When it became apparent to any-

one who made careful observations that its effect upon the fever was transient, that almost as frequently the temperature rose after the bath as fell, this theory became untenable and was abandoned. But tubbing was continued without theory. Later the patients were subjected to the bath on the ground that it was a nerve stimulant. The truth of this hypothesis can hardly be affirmed or denied, for it can neither be proven nor disproven. When this theory was rejected the baths were continued as before. The last and present theory is that bathing increases the elimination of ptomaines. The baths certainly are diuretic, but that they eliminate ptomaines is incapable of proof because at present we have no method by which ptomaine elimination can be accurately measured. It has been said that the urotoxic co-efficient is increased after the baths, but it is perfectly safe at the present time to say that until chemistry shall afford a method of obtaining quantitative and qualitative results as to the toxins found in the urine all theorizing as to the increased urotoxic co-efficient must be absolutely worthless as a guide to clinical procedure.

Much as the author deprecates the continued popularity of the cold-bath treatment it is meet that it should receive proper description in a work of this nature. Brand's original method has been so modified that the consensus of opinion of the advocates of this form of treatment seems to be in favor of tub bathing at a temperature of from 80° to 90° F. (26.5° to 32.5° C.), although certain authorities believe that tubbing at 98° F. (36.5° C.) produces quite as good results and is much less disturbing to the patient.

The technique of the procedure may be described as follows: To carry out the process properly at least two attendants are necessary, for the patient must be lifted into the tub which is placed at his bedside. The tub should contain water enough to cover the patient to the neck, the head should be supported upon a rubber air pillow attached to the edge of the tub and his comfort will be augmented by placing a rubber air cushion beneath the buttocks. If the initial plunge into the cold water be disagreeable the bath may be begun at a comfortable temperature and cold water may be gradually added until the temperature is reduced as low as required. It is better, however, to use cold water from the beginning for the effect sought is a reaction and for this a certain amount of shock is necessary. The patient, wearing swimming trunks or covered by a sheet, should be gently lifted by the attendants and lowered into the water. Cold water—60° F. (15.4° C.) or less—should be poured over the head or a frequently changed cool compress should be applied to the forehead. The cold water may be applied to the head by means of an ordinary irrigating apparatus.

Vigorous rubbing of the body by the hands of the attendants is an absolute necessity. The bath should last from ten to twenty minutes according to the reactive power of the patient. At the end of the procedure the patient should be lifted from the tub and placed on the bed—over which a rubber

sheet and a blanket have been previously spread—the water having been allowed to drain off for a few seconds to prevent wetting the blankets. Now, being wrapped in the blankets, he should be thoroughly dried by rubbing. If the patient shows signs of poor reaction while in the bath, such as blueness of the lips and extremities or decided shivering, or if the effect upon the heart is untoward, the duration of the bath should be lessened and its temperature raised. In most patients chattering of the teeth may be disregarded and cyanosis of the extremities alone need not be considered sufficient reason for stopping the bath, but if marked blueness of the face, especially about the nose, be noticed, the patient should be immediately taken from the water. Before the patient is put into the bath and after he is taken out some authorities recommend the administration of a glass of wine, a half ounce (15.0) of whiskey, or a half to one drachm (2.0 to 4.0) of the aromatic spirit of ammonia, diluted, but these stimulants seem hardly necessary as a routine and would better be husbanded against an occasion of real need. During the bath a glass of cold water may be allowed.

The patient's reactive powers may be measured by a tentative bath at 90° F. (32.5 C.), reduced to 80° F. (26° C.) and lasting five minutes, and the initial temperature, the reduction, and the length of the following bath may be determined accordingly. If possible the physician should be present during this bath, both to guard against the possibility of shock and to make sure that the good effects of the procedure are not lessened by too early termination. If the cold tub is not well borne by the patient, warm baths given in the same manner are often followed by good results.

In private practice the carrying out of this method of treatment is fraught with difficulty for obvious reasons. It is best managed by procuring an ordinary tin bath tub which may be easily be moved from place to place. This, as well as the wheeled tubs used in hospitals should be filled freshly for each bath.

The preparation of the bed for the reception of the patient after the bath is of utmost importance. All should be ready before the beginning of the procedure, so that should it become necessary to terminate the bath suddenly there may be no delay. Two warm blankets should be provided and several hot water bags as well, and an ice cap should be ready for the head. Under the lower blanket should be placed a piece of water-proof cloth, over it a warm sheet upon which the patient should be laid ~~upon~~ when lifted from the tub. The sheet should then be wrapped about him and tucked between the arms and body so that no two skin surfaces shall come in contact. The patient is thoroughly dried by being rubbed outside the sheet. This is then removed and he is allowed to lie between the blankets with the hot water bottles against his feet and the ice cap upon his head.

About twenty to thirty minutes after the bath is over the patient will have ceased to be cold and his temperature should be taken to ascertain the effect

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of the procedure; it should be taken again three hours after the beginning of the bath in order to learn if a second is necessary, it being the custom to give the cold tubs every three hours if the temperature reaches 102.5° F. (39.1° C.) or more.

The fall in temperature following the bath varies in different patients as well as in the different weeks of the disease. In the first week it may not fall so much as one degree (F.), but in the later weeks drops of from two to three degrees (F.), are common. In addition to the lowering of the temperature the bath is said to mitigate the other symptoms, increasing the strength of the heart, and lessening the tendency toward cerebral disturbance. Hæmorrhage during a course of these baths is especially to be feared.

Contra-indications to bathing are few. The menstrual period and pregnancy do not contra-indicate but at the slightest sign of hæmorrhage, peritonitis or perforation the procedure should be stopped. Extreme heart weakness, marked arteriosclerosis, old age, and complicating pneumonia, pleuritic effusion, or phlebitis are contra-indications. Obese patients should be bathed with care. There are certain persons who, for no apparent reason, do not bear tubbing well. In such it is wise to omit the process.

The Bed Bath. In instances where tub bathing is inconvenient or impossible the bed or slush bath may be employed. Many patients to whom the cold tub is almost unendurable bear it well and are favorably affected by it. It is given upon a bed around the edges of which rolled blankets have been placed so as to form a sort of a wall. Over this is placed a rubber sheet and into the trough thus formed several pails of water are poured. The patient is placed in this and treated just as when the tub bath is employed. The bed bath may be constructed also by passing a piece of clothes line around the head and foot of the bed, connecting these by two parallel lines and throwing over the whole a rubber sheet which is attached to the lines by clothes pins; or a rectangular fence about eight inches in height and slightly smaller than the mattress may be constructed over a which rubber sheet may be thrown. The water from these improvised tubs is best drawn off by a siphon made of a few ~~few~~ feet of rubber hose.

The sponge bath is indicated when the temperature is hardly high enough to warrant the more drastic tub bath and yet is sufficiently elevated to cause discomfort. In any case the patient should receive two sponges daily for the sake of cleanliness. The method is as follows: The water may be of various temperatures as indicated; often the addition to it of a little alcohol is grateful to the patient. An ice cloth should be applied to the head and a sponge or soft cloth wet just sufficiently to leave a thin film of moisture on the skin is used; this cools the patient by rapid evaporation and does not wet the bed clothing and with it he is thoroughly rubbed, while the other hand is performing friction, and then dried, one part at a time. Care should be observed to keep the portions of the body not being sponged, covered. Particular

attention should be given the back for here the tissues retain heat longest. Proper reaction is evidenced by redness of the skin. No such effect is expected to be produced upon the temperature by sponging as by tubbing.

The sprinkle bath as a method for the reduction of temperature may be considered to rival the tub bath. It is better borne by many patients and is of peculiar adaptation to private practice.

The technique is as follows: The head of the bed should be raised about ten inches from the floor, and, to keep the mattress from sagging, crosswise under it, should be placed several boards as long as the width of the bed. The mattress should be covered with a rubber sheet upon which a pillow and ordinary sheet are adjusted. The patient should be stripped and sprinkled with water of the desired temperature from a watering pot or from an irrigating apparatus to the tube of which a sprinkling nozzle is fitted. The water as it flows from the foot of the bed is received in any large vessel and may be used over and over, the proper temperature being maintained by the addition of ice. The water should not be poured from too great a height and should be applied chiefly to the abdomen and legs. Rubbing with the hands should be continued throughout the procedure, otherwise the patient should be dealt with exactly as in tub bathing.

The wet pack is another useful hydrotherapeutic procedure which is less unpleasant to the patient than the tub. The body from the axillæ to the groins is wrapped in a sheet which is kept cool enough, by repeated wettings, to control the temperature.

Antipyretic Drugs. Certain drugs of this class, such as antipyrine, acetphenetidin, acetanilide, etc., may be used in excessively high temperatures but they are not to be recommended because of the possibility of their causing cardiac depression. Neither do they, although they may bring about a fall in temperature, act favorably upon the other symptoms of the disease. Lactophenine, in daily dosage of sixty to seventy-five grains (4.0 to 5.0) may cause a prompt fall in temperature, quiet the nervous system and induce sleep. Quinine and euquinine also cause the temperature to drop, but none of this class of drugs affects the course of the disease and they are not to be recommended save as adjuncts to other forms of treatment.

Treatment by intestinal antiseptics other than chlorine has been frequently advocated. Among the drugs discussed in this connection may be mentioned:

Phenyl salicylate (salol) in doses of from five to ten grains (0.30 to 0.65) four to five times a day. To ensure breaking up into its constituents in the small intestine an alkali, as sodium bicarbonate, should be administered with each dose. The possibility of injuring the kidneys more than overbalances any possible good effect that this drug can accomplish.

Thymol in the same dosage is open to the same objections.

Calomel as an intestinal antiseptic is practically inert and the good effects reported from its use have doubtless been due to the free purgation in the

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early period of the disease which its exhibition induces. It is possible, however, that a small portion of the calomel may be changed into corrosive sublimate and thus exert some antiseptic effect.

Betanaphthol in five to ten grain (0.30 to 0.65) doses three or four times daily, is claimed to be capable of causing intestinal antiseptics without toxic symptoms. Its use is recommended in combination with bismuth salicylate when there is diarrhoea, with magnesium sulphate when there is constipation. It is asserted that under the influence of this drug there is less tendency to abdominal pain and tympanites, the tongue becomes clear and the stools odorless, convalescence advances rapidly and there is diminished tendency to complications.

Phenol and tincture of iodine, one part to two, in doses of one to three minims (0.065 to 0.2) well diluted, three to six times a day have been recommended. Naphthalene is objectionable on account of its large dosage, unpleasant taste and liability to cause strangury. Beer yeast, three tea-spoonsful (12.0) in milk per day, has been given in the hope that its micro-organisms might inhibit the growth of the typhoid bacilli in the intestine, but little is to be accomplished by this agent save a checking of the diarrhoea.

Acetozone is the commercial name given to a mixture of benzoyl-acetyl peroxide, an inert absorbent substance. It is administered as an intestinal antiseptic, the daily dosage being ten to twenty grains (0.65 to 1.30) dissolved in a quart of water. Various observers have reported upon this preparation, claiming that when taken early in the disease and in large amounts the course is shortened to ten to twelve days. Also under its influence the abdominal, nervous and other symptoms are less marked than usual. There is much difficulty in inducing patients to take sufficient amounts for long enough periods of time.

Treatments by Means of Intestinal Antiseptics and Free Elimination. The object of these methods is to render the alimentary tract as aseptic as possible and to remove without delay the cause and products of the infection. As far as the antiseptic part of the treatment is concerned it differs in no way from the methods hitherto described, but added to these is the free exhibition of purgatives, which are given to carry off the fæcal accumulations, the patients being encouraged to drink large quantities of fluid to replace that removed by purgation.

The simplest of these forms of treatment is as follows: This consists of the daily administration of calomel in one-fourth to one-half grain (0.015 to 0.030) every half hour up to six doses; two or three hours later one-half ounce (15.0) of Epsom or Rochelle salts is given. The object is to bring about three to four free movements per day. Phenyl salicylate (salol) in five grain (0.30) doses, every three hours, is the antiseptic used in connection with this treatment. The claims are not excessively extravagant, but it is believed that under this treatment hæmorrhage and perforation are rendered

less frequent. The possibility of salivation from the calomel must be considered, but it is not likely to take place, probably because of the frequent movements from the bowels.

Another method of treatment which at one time created a considerable amount of discussion is as follows: Tablets consisting of podophyllum resin 1-960 grain (0.00067), calomel 1-16 grain (0.004), guaiacol carbonate 1-16 grain (0.004), menthol 1-16 grain (0.004), eucalyptol, in small quantity, were ordered. One of these tablets was given every fifteen minutes during the first twenty-four hours and in larger doses during the second day, if necessary, until at least five or six free defæcations had taken place during the second and third days. On the third or fourth day tablets containing podophyllum resin 1-960 grain (0.00067), calomel 1-16 grain (0.004), guaiacol carbonate $\frac{1}{4}$ grain (0.016), menthol 1-16 grain (0.004), thymol 1-16 grain (0.004), eucalyptol as before were prescribed; one every two or three hours. Both these tablets were given at longer intervals if there was a fall in temperature. On the fourth or fifth day guaiacol carbonate three grains (0.2), thymol one grain (0.065), menthol one-half grain (0.03), eucalyptol five minims (0.30) were administered in capsules, one every three hours alternating with the tablets. This plan of treatment in many instances, besides unnecessarily disturbing the patient failed to accomplish the result claimed for it and is now in little vogue.

Treatment of Special Conditions and Symptoms. The mouth and tongue should be kept clean by the employment of regular and frequent washings with the official liquor antisepticus diluted as may be necessary, tincture of myrrh, etc. A very useful mouth wash consists of equal parts of liquor antisepticus, hydrogen dioxide solution, lime water and water. The mouth should be cleaned after every administration of food and there is no contra-indication to the use of the tooth brush. Sordes and coating upon the tongue may be removed by cotton swabs wet in one of the above mentioned solutions. A convenient tongue-scraper may be constructed of a piece of whale bone bent into a loop. In cases where the tongue is extremely dry the "tongue-bath" often affords much relief. This consists simply in holding the mouth full of fluid for several moments. In this way considerable moisture is absorbed by the mucous membranes.

Heart Weakness.—In this condition it is better not to use alcohol unless the patient has been accustomed to the stimulant in health. In such a case it may be employed (brandy or whiskey) in doses necessary to produce the desired effect. As a heart stimulant strychnine nitrate—one-sixtieth to one-fifteenth of a grain (0.001 to 0.004) depending upon the condition to be met—is the stimulant of choice. Extreme heart weakness may necessitate the additional employment of digitalis—the tincture five to ten minims (0.30 to 0.65)—glyceryl nitrate—one one-hundredth to one-fiftieth of a grain (0.0006 to 0.0012)—or aromatic spirit of ammonia—one to two drachms



(4.0 to 8.0). Collapse may be treated by hypodermatic injections of camphor—one grain (0.065)—in olive oil or ether—fifteen minims (1.0). Marked asthenia may necessitate the intravenous infusion or hypodermatic injection of normal (0.9 percent.) sodium chloride solution.

Symptoms Referable to the Nervous System.—The headache and general pains of the onset may be mitigated by antipyrine salicylate in ten grain (0.65) doses every two hours, and by hot or cold applications. The delirium may be controlled by the use of the ice cap, and various sedatives, sodium bromide one-half to one drachm (2.0 to 4.0), sulphonmethane (sulphonal) fifteen to twenty grains (1.0 to 1.30), chloralformamide twenty to thirty grains (1.30 to 2.0), sulphonethylmethane (trional) ten to fifteen grains (0.65 to 1.0); hydrated chloral or morphine may be employed as a last resort, the latter best hypodermatically as Magendie's solution, ten drops (0.65) for a dose.

Tympanites may be lessened by the very careful introduction of a rectal tube, through which large quantities of gas are often voided, and by the internal administration of oleum terebinthinæ, five to ten minims (0.30 to 0.65) in capsule. The food should be diminished in quantity as the meteorism is the result of fermentative processes. High rectal irrigations of normal saline are also useful in this connection.

Diarrhæa, if obstinate, may usually be controlled by the use of bismuth, with the addition of opium if necessary.

Constipation is best treated by the use of saline enemata, though certain observers, as will have been noticed in the foregoing sections, have no objection to the use of calomel and other purgatives.

Bed sores should never be allowed to occur and may be prevented by attention to the points where they are likely to appear. The strictest cleanliness must be maintained about the back of the heels and over the buttocks and sacrum. The sheets must be kept smooth and the bed thoroughly clean and free from crumbs, moisture, and contamination from the rectal or vesical discharges. In addition to the maintenance of careful cleanliness, measures should be taken to harden the skin of the susceptible parts. To insure a good blood supply to these the patient should be turned upon his side several times a day and the skin of the back thoroughly rubbed with a dry towel and dusted with powdered talc. Applications rubbed into the skin to harden it, such as salt, two drachms (8.0), to whiskey, one pint (500.), or a dilute solution of lead subacetate may be employed. When the skin becomes red and irritated, but is still unbroken, it should be painted with a solution of silver nitrate, twenty grains (1.30) to one ounce (30.0) of water. When the bed sore has appeared, with the object of preventing its spread and of accelerating its cure, the patient must be so placed as to take all weight from the affected part; this may be accomplished by the use of a rubber bed ring. The sore itself must be kept clean by swabbing with one to five thousand

mercury bichloride solution and dusted with iodoform. A dressing of zinc oxide ointment spread upon gauze may be applied. In marked instances the use of the water bed may become necessary. If the sore spreads or burrows through the surrounding parts free incision and thorough irrigation are indicated.

Complications should, in general, be treated as when occurring independently, but the treatment of intestinal hæmorrhage, peritonitis, and perforation needs special consideration.

Upon the appearance of any symptom suggestive of *hæmorrhage* all hydrotherapeutic measures, however employed, should be stopped immediately and absolute quiet insisted upon. An ice coil should be applied to the abdomen and the food should be of the most non-irritating character; it is often wise to stop feeding entirely for six or eight hours. If the hæmorrhage is extreme, a hypodermatic injection of from one-fourth to one-third of a grain (0.015 to 0.020) of morphine sulphate should be given and the foot of the bed should be elevated. The administration of morphine or opium has the disadvantage that it may mask the symptoms of a concurrent perforation of the intestine, and on this ground certain clinicians consider it better omitted. If symptoms of collapse are present hypodermatic stimulation by means of ether or camphor in sterilized oil is necessary. In this connection hypodermatoclysis of hot normal saline solution or direct infusion into a vein is also useful. The most efficient drug in the control of the hæmorrhage is calcium lactate in doses of twenty grains (1.30) three times daily. Calcium chloride is also effective, both these substances having a decided influence in increasing the coagulability of the blood. Their use should not be continued for more than three or four days for their more protracted administration is likely to result in a diminution of the blood's coagulability. Gelatin in doses of seventy-five to one hundred and twenty grains (5.0 to 8.0) has been recommended in the treatment of hæmorrhage, and ergot one-half drachm (2.0) of the fluidextract—also has its advocates. Internal styptics such as tannic and gallic acids, lead subacetate, etc., may be employed, but their effect is problematical.

Perforation of the intestine and peritonitis necessitate early operative treatment, and by this means many patients are now saved who under less radical treatment would formerly have died. The earlier the operation is undertaken after the establishment of the diagnosis the better are the chances of recovery. Operation should be performed even in desperate instances, and when the condition is obscure an exploratory incision is advisable, the resistance to the shock of operation being usually good in typhoid patients.

Such surgical complications as periostitis and cholecystitis often recover without operation but when the presence of pus is clearly demonstrable radical treatment should be undertaken.

Phlebitis is here treated by gentle inunctions of soluble silver ointment,

of game biology

twice daily, the limb being kept wrapped in cotton during the interval between treatments.

Neuritis following enteric fever is frequently characterized by paralysis and although its symptoms may persist for months, as a rule recovery takes place under the influence of massage, electricity, and general tonic treatment.

The so-called typhoid spine may prove an obstinate sequel of the disease, and should receive the attention of the orthopædic surgeon if a peri-spondylitis is suspected. It is usually accompanied by a neurotic condition of the patient and requires practically the same treatment as neurasthenia, namely, rest in an institution where anxious and sympathetic friends are not given access to the patient, hydrotherapeutic measures, massage, and proper exercises. The application of the actual cautery may prove effective.

During convalescence the patient should be guarded against recrudescences and relapses, the treatment of which, should they occur, is practically the same as that of the original attack.

With regard to diet it may be stated that if the patient's nutrition remains good it is best to allow no solid food before the seventh to the tenth day after the return of the temperature to normal; solid food may be permitted earlier than this to patients who are weak and much emaciated, and in certain instances a persistent slight afternoon fever has been known to subside upon giving the patient simple solid food. The danger of inducing perforation by the too early administration of solids, however, must not be forgotten, and the same is true of too early muscular exertion. The first solid foods usually allowed are those which have been already mentioned. These should be given tentatively and with caution at first, and if no ill-effects follow, their quantity may be increased and a gradual return to ordinary diet permitted.

As stated, muscular exertion should be undertaken with great care and any excess of this, as well as of emotional excitement, should be studiously guarded against upon the ground that recrudescence may follow.

Protracted diarrhoea is often due to the presence of an unhealed ulceration, and in view of possible perforation, the patient should be kept in bed and on a fluid diet until there is evidence that the lesion has disappeared which will usually take place if bismuth naphtholate or tetraiodophenolphthaleinate is prescribed in doses of about five grains (0.30) three or four times daily in connection with astringent injections such as those advised for the treatment of ulcerative colitis. Obstinate constipation is better treated by simple enemata than by drugs.

With regard to the time when the patient should be first allowed to sit up, in general it may be said that by the end of the first week after the return of the temperature to normal he may be moved to a chair for a gradually increased time each day, and after a few days he may venture upon his feet and walk about slowly. By degrees he may resume his ordinary mode of life.

PARATYPHOID FEVER.

This is a term applied to a group of diseases which in clinical course closely resemble true enteric fever.

Etiology. The cause of these affections is a micro-organism intermediate between the *bacillus typhosus* and the *bacillus coli*, and which closely simulates or is identical with the *paracolon* bacillus. The modes of infection are probably similar to those of enteric fever.

Pathology. The morbid changes found in these affections consist of constant splenic enlargement and intestinal ulcerations resembling those of dysentery rather than those of enteric fever. The solitary and agminated follicles and the mesenteric glands are involved.

Symptoms. The incubation period is shorter than that of enteric fever, and the onset, which may be preceded for several days by prodromata such as malaise, headache and torpor, is usually more sudden. The lethargy appears earlier and this symptom as well as the headache is, as a rule, more marked. The temperature rises more rapidly than in enteric fever; an initial temperature as high as 104° F. (40° C.) has been noted. Intestinal symptoms are usually present; rarely hæmorrhage may occur but perforation has not been reported. Splenic enlargement and rose spots occur. The course of the disease varies; it may be short or, in other instances, prolonged; convalescence is usually shorter than in enteric fever; relapses may occur.

The differentiation from enteric fever is based upon the absence of the Widal reaction, and the causative micro-organism may be cultivated from the fæces, urine, the blood, and from the rose spots.

Prognosis. The disease may result fatally, but most patients recover.

The prevention of paratyphoid infections is identical with that of enteric fever.

Treatment. This is essentially the same as that of enteric fever with the exception that the serum employed in specific treatment must of necessity be a product of the growth of the *paracolon* bacillus.

BRILL'S DISEASE.

Definition. An acute infectious disease of unknown origin and pathology, characterized by a short incubation period, a period of continuous fever, intense headache, apathy and prostration, a profuse and extensive erythematous maculopapular eruption, the fever ceasing at the end of two weeks either by crisis or lysis.

Etiology. Males show a greater tendency to be affected than females, the largest number of cases occur in summer. It is more common between the twentieth and fortieth years. There is no evidence that it is communicable. The incubation period varies from sudden onset to fourteen days.

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Symptoms. After a period of a few days marked by malaise, inappetence, nausea, and slight headache the disease generally commences with a slight chill. Occasionally then follows vomiting, general pains or localized in the back. The headache becomes intense and prostration is marked with the rising temperature. The maximum of febrile disturbance is reached in two or three days, and, with but slight daily remissions, remains constant. During the fever the patient lies quietly groaning with pain as shown by the facial expression. His eyes are dull and suffused and the face flushed. He is dull and prefers to be let alone. The tongue is generally coated and moist. On the sixth day an eruption appears on the abdomen and back, spreads to the thorax, arms and thighs, and occasionally to the neck and upper and lower extremities. The rash is dull red in color, slightly raised, and does not disappear on pressure. The bowels are obstinately constipated. The pulse is full and rather slow for the temperature, of low tension, and often dicrotic. The spleen is frequently enlarged. Herpes labialis is sometimes seen. There is not much tendency to leukopænia, nine to eleven thousand leukocytes being usually observed. About the twelfth day the fever and other symptoms disappear and rapid convalescence follows.

Complications. Bronchitis is a common accompaniment of this disease, developing early. Broncho-pneumonia is quite rare and is the occasion of a marked leukocytosis, the highest observed was over twenty-three thousand. Meningismus, rigidity of the neck, contracted pupils, stupor, and bilateral Kernig's sign are sometimes present. Phlebitis was observed but once as was otitis media.

Diagnosis.—The absence of a positive Widal reaction and of a positive blood-culture point toward this disease. Enteric fever is excluded by time of incubation, character of onset, fever and eruption, time of appearance of prostration, frequency of labial herpes, absence of intestinal hæmorrhages, absence of relapses, and the rapid convalescence. Typhus fever, although the symptoms suggest it, is improbable because of the time of year during which this disease is mostly observed. If typhus fever is no longer communicable, has lost its grave nervous symptoms, and its toxæmia is no longer fatal this might be considered to be a peculiar typhus fever evolved from improved hygiene and sanitation. The meningismus occasionally suggests meningitis, but lumbar puncture determines its absence. Influenza is excluded by the history and particularly by its uncomplicated and speedy recovery.

Prognosis. Thus far no death has occurred in the two hundred and twenty-one observed cases of the disease.

Treatment. As a matter of precaution, although believed to be unnecessary, the measures employed for enteric fever are insisted upon. The symptoms are relieved as they occur and the diet is restricted to a fluid one.

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ROCKY MOUNTAIN FEVER.

Synonyms. Rocky Mountain Spotted Fever; Blue Disease.

Definition. An acute infectious disease characterized by a rather sudden onset with a chill, severe pains in bones and in joints, a purpuric eruption, and a high fever terminating in from two to seven weeks by lysis.

Ætiology. The disease occurs in the Rocky Mountain regions of Idaho, Montana, Wyoming, and Nevada; it is especially common in the Bitter Root Valley and along the course of the Snake River. It is most prevalent in the spring and early summer months, being very rarely observed at other seasons. Males are more commonly affected than females, probably because the occupations and habits of the former render them more liable to infection, and the disease most usually attacks individuals in early or mature adult life. It occurs less frequently in children. Persons who live in farming or grazing districts and those who spend most of their time in the open air, as carpenters, engineers, bridge builders, and individuals of similar occupation who are engaged in railroad and canal construction, seem most prone to acquire the infection.

Certain observers who reside in regions where the disease is frequently seen have considered its specific cause to be the *piroplasma hominis*, an organism nearly related to the *pirosoma bigeminum*, the cause of Texas cattle fever; they state that this parasite is found within the body of the red blood cells of individuals suffering from the disease and is transmitted to the patient by means of the bite of a variety of tick, the *dermacentor reticulatus*.

Prolonged study of the blood and red cells of infected subjects by other observers has failed utterly to show the presence of piroplasmata and has left the true cause of the disease in doubt; it seems, however, probable that the specific organism, if present in the blood, must be one very difficult of demonstration and one necessitating the employment of special methods of experimentation for its identification. Inoculation experiments with the blood of patients suffering from the affection have proven that the disease may be transmitted to guinea-pigs and monkeys since the fever, indurations, and skin manifestations exhibited by these animals after such inoculations simulate closely the symptoms exhibited by the human being.

Even if the theory that mountain fever is not due to a piroplasma, and in the light of our present knowledge it would seem that it is not, it is possible that the disease may be transmitted by means of a tick bite since it is probable that ticks may act as the hosts of other pathogenic micro-organisms than piroplasmata.

Pathology. The morbid changes observed upon necropsy consist of the cutaneous manifestations, which will be described in a later paragraph. In guinea-pigs, in addition to the skin phenomena, enlargement and a hæmorrhagic condition of the scrotum have been observed by Ricketts, together

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with swelling of the testicles, congestion of the epididymis, retention of the urine, distention of the seminal vesicles, congestion of the kidneys and suprarenal glands, swelling and congestion of the spleen and liver, and an enormous engorgement of the right heart and venous system. Meningitis has not been found although both the cerebral and spinal meninges may show some hypostatic congestion. Localized inflammatory conditions were observed in instances in which the skin of the swollen scrotum had become gangrenous and there was consequent staphylococcus infection of the underlying tissue.

Symptoms. The period of incubation is indefinite but probably varies from three to ten days; if the tick bite is a factor in the ætiology of the disease the symptoms may appear very soon after the infection, for patients have been reported who have exhibited the heads of ticks imbedded in the skin. The prodromal symptoms consist of malaise, nausea, and sensations of cold. The invasion of the disease is marked by a distinct chill, followed by an abrupt rise of temperature which by the second day reaches 103° to 104° F. (39.5° to 40° C.) and by the eighth to the tenth day may increase to an afternoon maximum of 105° to 107° F. (40.5° to 41.6° C.). The morning temperature is slightly lower than that of the evening. About the middle of the second week the temperature falls by lysis, usually reaching normal by the fourteenth day. With the initial rise in temperature there is generally pain in the body and limbs; during the second week nose-bleed, more or less severe in character, occurs; the tongue is coated down the middle, red at the tip and edges, and in severe infections may become dry, brown, and cracked; sordes may be observed; nausea and vomiting and usually constipation are present. The urine is scanty, dark, and contains an increased amount of urates; albumin and casts may be present. The spleen and liver are increased in size and the conjunctivæ may be of sub-icteroid hue. The pulse is weak and rapid, frequently as high as one hundred and fifty; the respirations are rapid and regular but shallow. They may reach sixty per minute, but are usually about forty. Bronchitis may develop at the end of the first week, and pneumonia may be a serious complication. In severely infected patients the mental condition may resemble that of enteric fever. The leukocytes, especially the large mononuclear cells, may be moderately increased, there is destruction of the red cells and diminution in the amount of hæmoglobin.

The eruption appears from the third to the fifth day, first upon the wrists, ankles or back, thence it spreads to the arms, legs, forehead and body, the abdomen being last involved. The spots may appear so rapidly as to cover all the skin within twelve hours, but usually two or three days pass before the height is reached. The rash first consists of bright red circular spots from the size of a pin point to that of a pea and resembles the eruption of enteric fever; the spots are not elevated and in the beginning disappear on pressure; they may be tender and in severe types of the disease are dark blue or purplish

in color, and increase in size until the skin takes on a mottled appearance; before disappearing they may assume a greenish-yellow hue. The spots begin to fade at the end of the first week and lose their petechial character as the fever declines. Desquamation begins during the third week, but the spots may not wholly disappear for weeks or months. The skin may become jaundiced or gangrenous over the elbows, fingers, toes, or scrotum. In marked infections the spots coalesce and the skin takes on a mottled appearance which is quite typical of this disease.

Diagnosis. The appearance of the patient is quite characteristic, and those who have seen a few patients suffering from it find little difficulty in recognizing the disease. Typhus fever occurs among those who live in poor sanitary surroundings in crowded city districts and in those closely confined in ships, jails, and the like. Epidemic cerebrospinal meningitis is characterized by the presence of typical meningeal symptoms and has a specific bacteriological ætiology. Purpura hæmorrhagica may be differentiated by its history and the accompanying scorbutic or rheumatic manifestations. The fact that the Widal and the Ehrlich diazo-reactions and bacteriological examinations are negative will assist in separating mountain from enteric fever.

Prognosis. The severity of the affection is apparently commensurate with the skin eruption (Mayo). In marked types of the infection the skin of the scrotum and thighs becomes much darkened, areas of gangrene make their appearance, and in such instances death usually takes place here as it often does in those patients who exhibit other symptoms of profound toxæmia, such as high temperature, cardiac weakness, and cerebral manifestation. In the Bitter Root Valley the disease is particularly fatal, eighty-four deaths in one hundred and twenty-one instances of the affection having been reported. Death usually occurs during the second week, in some instances complications, especially pneumonia, being responsible.

Prevention. The districts in which the disease is common should be avoided during the months in which mountain fever is prevalent. Measures to avoid tick bites should be taken and when these have taken place the insect should be at once removed by the application of kerosene, ammonia, or turpentine and the wound cauterized by pure phenol.

Treatment. This is, in general, symptomatic. The employment of quinine given in large doses hypodermatically has given favorable results in a few instances. The fever may be controlled by the hydrotherapeutic measures indicated in enteric fever; the bowels should be kept thoroughly open with calomel followed by the salines. High intestinal irrigation is also useful. Elimination by means of the skin and kidneys should be assisted by the usual method applicable in infectious febrile diseases; the severe pains may be relieved by means of the administration of Dover's powder or small doses of morphine, preferably given by hypodermatic injection.

The patient's strength and nutrition should be maintained by means of easily digestible fluid food; fortunately the digestive tract does not appear to require such careful management as in enteric fever, consequently the feeding is a more simple matter than in this latter disease.

The nursing and general management of the patient should be carried out along the lines suggested in the section on the treatment of enteric fever; the patient should be kept in a quiet, darkened room during the acute stage of the disease.

INTERMITTENT TICK FEVER.

Under this term Kieffer has recently described what he considers to be a form of ixodiasis which has been observed by him in Wyoming. He reports seven instances of the disease, from which he concludes that it appears necessary to produce the infection that the tick should fasten itself to the skin of the patient. It also seems probable that the number of the insects biting the patient has some influence upon the severity of the attack to follow. In all the patients observed there was distinct history of tick bites as well as indubitable evidence of the bite at the place where the insect had fastened itself. At these points, in a number of the patients, small nodules were observed; these persisted for weeks, were firm, pale in color, entirely painless, and varied in size from that of a pea to that of a small marble. In other instances the site of the attachment of the insect was marked by a small red papule in some of which the rostrum of the tick was demonstrable. Specimens of the insect examined by Stiles, were proven to be identical with the *dermacentor occidentalis*.

The patients were affected, in general, as follows: After a period of incubation varying from three to seven days, during which prodromal symptoms consisting of headache, vague pains, nausea, and vomiting are present, the disease is ushered in by a severe chill lasting from two to three hours. It is not characterized by chattering of the teeth and shivering like the chill of malaria, but is associated with more pain and discomfort, and the patient seems to suffer quite as much as in the painful stages of influenza or dengue. The pains affect chiefly the head and the bones and joints. Following or accompanying the chill there is an elevation of temperature which reaches 103° to 104° F. (39.4° to 40° C.). The fever remains high, as a rule, for forty-eight hours, but in some instances persists for but half this period, and is followed by a remission during which the temperature drops to normal or approaches this point. With the remissions the pains disappear and the patient, while he feels weak and exhausted, is otherwise comfortable. The temperature remains normal for about forty-eight hours when the second chill begins and is followed by a febrile movement. This paroxysm terminates in a manner similar to the first. Succeeding paroxysms are usually

milder in degree. Rarely there is a febrile movement lasting one day but here there is an intermission lasting three days.

Other symptoms are abdominal pain and general, but not very marked, tenderness. Tympanites sometimes is observed. The liver is not demonstrably increased in size but there is early moderate enlargement of the spleen and the regions of these organs may be rather more tender than other areas of the abdomen. The urine is usually concentrated and high colored but is in no way typical. No skin eruption has been noted.

The blood showed absolutely no agglutination reaction to the typhoid bacillus and no malarial organisms were found, although the blood of each patient was searched. Careful search was also made for the *piroplasma hominis* but no bodies were found which could be considered to resemble this organism except a few objects which were considered to be artefacts or evidences of vacuolization in the red blood cells. A progressive diminution in the number of the red cells was constantly present and there was a corresponding diminution in the amount of hæmoglobin. Examination of the leukocytes showed a constant moderate relative increase in the number of the large mononuclear cells; this is the case in malaria and is said to occur also in Rocky Mountain spotted fever.

Treatment. The administration of quinine appears to have no effect upon the disease and seems to increase the discomfort of the patient, but arsenic, given by hypodermatic injection, is believed to control the paroxysms and exert a curative action upon the infection. The arsenic injections may be followed by a burning sensation and to obviate this the addition of cocaine is suggested. Kieffer suggests the following formula: Sodium arsenate one part, cocaine hydrochloride four parts, water one hundred parts. Thorough antiseptic precautions are necessary to prevent abscess formation. The dosage is from fifteen to thirty minims (1.0 to 2.0) twice a day. During convalescence the patient's anæmia should be combated by means of arsenic *per os* in connection with iron and other tonics.

TYPHUS FEVER.

Synonyms.—Jail, Camp, Ship, Hospital, Putrid or Spotted Fever; Black Death.


Definition.—An acute, very infectious disease characterized by a typical skin eruption, nervous symptoms and a high temperature terminating usually by crisis in about two weeks.

Ætiology.—Typhus, while comparatively rare during the past few decades, was formerly one of the world's greatest scourges. Its gradual disappearance is undoubtedly due to the increased attention paid to sanitation and the education of the masses along general hygienic lines.

The disease is of markedly infectious nature but up to the present its

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specific cause has not been determined. It is most common in young adults but no age is exempt. Its occurrence is favored by crowded and filthy conditions, unhygienic surroundings and mode of life, poor ventilation, and famine. As these factors are becoming year by year less conspicuous features of our civilization there is every reason to hope that the disease will ultimately disappear from the earth.

Isolated cases at times have occurred, but despite this evidence and the fact that Murchison considered the spontaneous origin as possible, it is not to be regarded as a probability in the light of present-day knowledge.

While the nature of the contagion is unknown it is recognized that it is of easy acquirement and difficult of destruction. It seems to be transmitted through the atmosphere and to be given off from the patient's body. Consequently it is communicable from one person to another and through furniture, bedding, clothing, etc., to which the poison of the disease clings for long periods. It is said that the contagium cannot pass through the air from hospitals or other structures in which patients suffering from the disease are confined, to dwellings in the vicinity. To acquire the infection intimate and fairly continuous association with the patient seems to be necessary, consequently nurses are much more frequently affected than physicians who are with the sufferer for but a few moments each day, unless indeed, these latter are in attendance upon a typhus hospital or ward.

It has been thought that the contagium is given off from the skin and in the expired air; it may, however, be in all the body excretions and discharges for anything that is certainly known to the contrary.

Pathology. There are no characteristic *post mortem* lesions. The tissues show the changes which always accompany acute febrile disease of severe type. The petechial eruption persists after death, in contradistinction to that of enteric fever, and bed sores may be present; the blood is dark and fluid. The spleen and lymph glands are enlarged and soft, the kidneys and liver may be increased in size. The tissues, including the muscles, and particularly that of the heart, and organs are in a condition of acute degeneration (cloudy swelling). There is no intestinal ulceration; the lungs are frequently the seat of hypostatic congestion and there may be evidences of bronchial inflammation.

Symptoms. The incubation is from ten to twelve days; the invasion is usually sudden but general malaise may occur before this event takes place. The invasion is marked by one or more chills followed by fever and headache and severe bodily pain, especially in the back. After the initial chill the temperature rises rapidly and reaches its maximum (104° to 106° F.)—(40° to 41.1° C.) from the fourth to the seventh day. The patient is greatly prostrated, his tongue is coated and soon becomes dry, nausea and vomiting are commonly present, the eyes are suffused and the expression is apathetic. Bronchitis is frequent. The bowels are usually constipated.

After reaching its maximum at the end of the first week, the fever continues with slight morning remissions for from twelve to fourteen days. At the end of this period it usually begins to fall by crisis and may drop to a subnormal level within twenty-four hours. Death in severe infections may be preceded by a temperature of 108° to 109° F. (42.2° to 42.7° C.).

The pulse is at first rapid and full but soon becomes weak and perhaps dirotic as the disease progresses; the first sound of the heart may be indistinct and a systolic apical murmur may be present. A slow pulse indicates a grave infection.

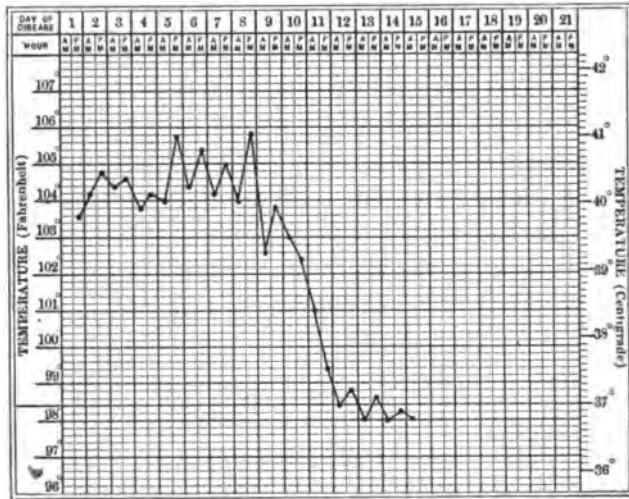


FIG. 2.—Clinical chart of typhus fever ending in recovery.

The respirations are rapid, their rate often being further increased by pulmonary congestion, bronchitis or a co-existent broncho-pneumonia which may be followed by pulmonary gangrene.

The urine is scanty and high colored and frequently contains albumin and casts.

There may be a slight increase in the number of the leukocytes, the opposite of this condition obtaining in enteric fever.

The eruption is constant and appears on the third to the fifth day; its evolution is rapid. It presents itself first upon the chest and abdomen and, quickly spreading to the limbs and face, involves the whole body within two or three days. The rash consists of two elements: a dark mottling of the skin characterized by blotches of light or dark purple; these may be rendered lighter in color by pressure and at times become the seat of subcutaneous hæmorrhage; and a slightly raised petechial eruption. This is pinkish in

color and resembles the rash of enteric fever, disappearing at first on pressure but later persisting; these spots also are hæmorrhagic and, like the mottling, persist *post mortem*. After the eruption, which lasts from seven to ten days, has disappeared, desquamation usually takes place. Children, in whom the disease is seldom fatal, may show no rash whatever, or the skin may be covered by an eruption, not unlike that of measles, to which the term mulberry rash has been sometimes applied.

During the second week all the symptoms become more marked. At this time the face is apt to assume a peculiar dusky hue. The eyes are generally bright. The prostration is severe, and the mental symptoms are either an active delirium accompanied by hallucinations which frequently are terrifying and cause violence, or changing into stupor the patient is regardless of his surroundings. Subsultus tendinum, nystagmus and even coma vigil develops. The tongue is cracked and dry, the teeth are covered with sordes, the temperature is persistently high, the pulse rapid, weak and perhaps dicrotic, the respiration is accelerated and the patient may die exhausted by the infection. In the event of his recovery the temperature rapidly falls by crisis and a deep sleep occurs from which the patient awakes greatly improved, the mental and all other symptoms being in a much ameliorated condition. The convalescence now progresses unless a relapse, which rarely takes place, occurs.

Variations in the course of the disease may be observed. Both malignant forms, in which death supervenes within a few days, and mild types with only slight rise in temperature and other insignificant symptoms, have been described.

Complications. Of these broncho-pneumonia, sometimes resulting in gangrene, is the most frequent. Gangrene of the extremities, paralysis and septic infections, such as subcutaneous abscesses, parotitis and arthritis, may occur. A postfebrile neuritis resulting in paralysis is not rare. Noma has been observed in children.

Diagnosis. In epidemics this is easily made but isolated cases may be mistaken for enteric fever, from which typhus fever may be differentiated by its more rapid initial rise in temperature and otherwise more sudden invasion, by its eruption and the absence of Widal reaction. In malignant smallpox the more common occurrence of hæmorrhages is an aid in differentiation. Epidemic cerebrospinal meningitis at its onset may closely resemble typhus fever but after a few days the diagnosis is usually clear, and malignant measles may be differentiated by the accompanying conjunctivitis and coryza and the fact that other cases of measles are in the vicinity. The eruption of measles is of brighter red, presents itself first on the face and is likely to be crescentic in form.

Prognosis. This varies in different epidemics ranging at times as high as fifty percent., the usual figures are, however, from twelve to twenty percent. In children the disease is seldom fatal.

Treatment. Patients suffering from typhus fever should be strictly isolated, preferably in tents where the free ventilation not only exerts a favorable effect upon the patient but renders the physicians and attendants less likely to contract the disease. The fever should be controlled by the hydrotherapeutic measures employed in enteric fever. By these means not only is the temperature lowered but a favorable influence is exerted upon the nervous system. Coal tar antipyretics should not be relied upon although they may be occasionally prescribed in connection with other antipyretic treatment. Their weakening effect upon the heart should never be lost sight of, and if given, these drugs should be administered in connection with stimulants which shall counteract this action. Heart stimulants are indicated early in the disease and of these alcohol in the form of whiskey or brandy is to be preferred; digitalis and strychnine are also useful in this connection. Quinine is strongly recommended. Attacks of cardiac failure should be combated by the hypodermatic administration of ether and camphor and the general treatment of symptoms is practically identical with that indicated in enteric fever. The bowels should be kept freely open from the onset of the disease, it being usual, when seeing the patient for the first time, to prescribe a course of calomel in fractional doses to be followed by a saline laxative. The specific treatment by means of the phenolsulphonates, phenol and other antiseptics is probably useless.

In the treatment of this disease the one fact to be kept in mind is that sufficient stimulation is necessary to counteract the continued tendency to heart weakness. In order to control this symptom the dosage should be regulated in accordance with the patient's condition. In markedly asthenic states the hourly administration of as much as an ounce (30.0) or more of whiskey may be necessary.

The diet should be entirely of fluids during the febrile stage, milk either plain or in the form of punch with egg and brandy, nourishing soups and the like should be frequently given. As convalescence becomes established soft solids and a gradual return to the ordinary diet may be allowed. (See diet of enteric fever, pp. 17 and 18.)

When the disease is treated in hospital wards or private dwellings the most thorough ventilation must be insisted upon.

During the course of the disease the excreta, both urine and feces, and all articles which come into contact with the patient should be disinfected and if possible destroyed. Clothing should be immersed in a five percent. solution of phenol and boiled so soon as is possible. After recovery the patient's room and its contents must be thoroughly disinfected and aired for at least a week.

In case of recovery the patient must be given hot baths for several days before his discharge, especial attention being paid to all hairy surfaces.

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MALTA FEVER.

Synonyms. Mediterranean Fever; Neapolitan Fever; Rock Fever; Undulant Fever.

Definition. An acute infectious disease typified by an irregular temperature, profuse sweating, diffuse pains, swelling of joints, and a tendency to relapse.

Ætiology. This disease prevails at Malta and in countries bordering upon the Mediterranean Sea. While infrequent in other regions, it has been observed in the West and East Indies, in China and the Philippines. One or two instances have made their appearance in England but none has been reported in the United States excepting in the Mississippi Valley. Malta fever attacks young adults most frequently and prevails chiefly in the summer; its occurrence is favored by unsanitary conditions.

The specific cause of this affection is the *micrococcus melitensis* discovered by Bruce in 1887. This organism is found in the spleen in all instances of the disease which have come to necropsy but as yet has not been isolated from the blood. When inoculated into monkeys a similar disease to that occurring in human beings is produced and the micrococcus may be isolated from the tissues of the infected animals. The organism probably enters the body either upon the inspired air or upon dust or in drinking water; in one instance the infection has taken place through the conjunctiva. In Malta the infection seems to be generally introduced into the system in goats' milk which is extensively employed instead of milk from the cow. At least one-half of the goats are infected by the disease and of these one-fifth excrete the micrococcus in their milk. It may also take place from bites of insects or other accidental inoculations. It has been shown that the blood of patients suffering from Malta fever causes agglutination of pure cultures of the bacillus.

Pathology. No definitely characteristic lesions are found in patients dying of this disease save those due to high temperature and the presence of toxins in the blood. It has been stated that the spleen is always enlarged but that the mesenteric glands are only moderately so. Peyer's patches show no specific inflammation. There is likely to be found hypostatic congestion of the lungs but pneumonia is rare.

Symptoms. The incubation period is from a few days to three or four weeks. The invasion of the disease is gradual, without chill or marked rise in temperature, but is accompanied by malaise, headache, restlessness and anorexia. These symptoms persist from one to three weeks when the temperature falls and remains normal for two or three days, then it rises once more, is accompanied by chills, associated with which is the return of the other symptoms previously mentioned. This relapse lasts a month or six weeks when a second remission takes place. This may last from one to two weeks and is succeeded by a second relapse which is accompanied by more

marked symptoms than the first, and in addition, others, such as sweats, joint pains, effusions, marked and persistent constipation, inflammations of the fibrous tissues, and orchitis; following this is a third remission, after which in turn, another relapse appears, characterized by the symptoms of those preceding, with high fever, night sweats and severe pains. The spleen is as a rule enlarged and may be tender.

The characteristic features of this disease consist in the recurrence of rises of temperature lasting from one to three weeks and separated by afebrile intervals lasting a few or more days. The relapses may recur for two or three years but the usual length of the disease is three or four months. The fever, pain and other symptoms, if long continued, must necessarily exert an exhausting effect on the patient which may prove fatal. Cardiac and somewhat rarely, pulmonary complications may augment the severity of the disease and become factors in its fatal outcome.

Variations in the type of Malta fever occur, a malignant variety, which may result fatally within one or two weeks and a mild form with few symptoms save an evening rise of temperature, having been described. One attack of the disease is likely to confer immunity, for several years at least.

Diagnosis. The differential diagnosis from enteric fever may be made by means of blood examinations or, in case of failure to find the micrococcus, by agglutination tests.

Prognosis. This is usually favorable, the mortality being put at about three percent. by most observers. If the patient survives for two or three weeks he is likely to recover.

Treatment. No drug has a specific effect upon this disease. Attempts have been made to elaborate an antitoxin and at least one patient seems to have been successfully treated by this means. The advantage of employing vaccines made from the dead micrococcus awaits final judgment. Quinine and the salicylates are apparently useless.

The bowels should be kept open and the kidneys active. Hydrotherapeutic measures, particularly sponging with cool water, should be employed to control the temperature and the symptoms should be relieved by the methods applicable in like conditions, such as those which occur in enteric fever. Medicinal antipyretics are of little use. Insomnia, cephalalgia, joint and testicular inflammation should be treated by ordinary methods.

Recently it has been suggested that an exclusively liquid diet is unnecessary unless the temperature runs above 103° F. (39.5° C.). If milk is employed it must be boiled. However a milk diet is safer to which later may be added broths and eggs and even stimulants if required. To patients whose evening temperature does not rise above this point easily digestible solids, such as the cereals, eggs and bread, are allowed in addition to milk and broths. Even fish and meat are permitted if no ill-effects result from the lighter solids.

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During convalescence the patient's exhaustion and anæmia should receive tonic treatment, he should keep in the fresh air as much as possible and his emaciation may derive benefit from inunctions of codliver oil or lanolin. A change of climate, when the patient is able to travel, is distinctly indicated, but undue fatigue is likely to provoke a relapse.

RELAPSING FEVER.

Synonyms. Famine Fever; Recurrent Typhus; Spirillum Fever; Seven Day Fever.

Definition. A specific acute infectious disease characterized by a febrile movement lasting six or seven days, followed by an afebrile interval of about a week, after which the febrile paroxysm recurs and may be repeated three or four times.

Ætiology. The most favorable conditions for the development of this disease are those of over-crowding, famine and filth, just as is the case with typhus fever. It is common in East India and has prevailed at times in Europe and the United States. It has not been observed, except in isolated instances, in this country, however, since 1869. Age and sex seem to have no influence upon its incidence.

The specific cause of the infection is the spirochæta or spirillum of Obermeier which was first described in 1873. This organism is a spiral shaped bacterium, always motile, in length from three to six times the diameter of a red blood cell. It is found in the blood, but only during the febrile stage; it has never been demonstrated in the secretions or excretions. The disease has been produced in human beings and monkeys by the injection of blood from a patient during the febrile stage. Formerly it was believed that recurrent fever was transmitted by means of fomites but the more recent studies of Tictin tend to confirm the idea that it may be carried by means of suctorial insects such as bed bugs, since blood taken from one of these insects which had bitten an infected individual has produced the disease when injected into apes.

One attack of the disease does not confer immunity.

Pathology. No typical morbid changes are observed after death from this disease. During the febrile movement, however, the spleen is enlarged, and in rare instances may show infarcts or even be ruptured. The viscera are swollen and are the seat of an acute degeneration. The kidneys are swollen and the renal epithelium may show cloudy swelling, which is also found in the liver-cells. The skin may be jaundiced and ecchymotic and the bone marrow is in a state of hyperplasia.

Symptoms. The incubation period is usually about one week although the symptoms in certain instances may appear within a day or two after infection. The onset is sudden with a chill followed by fever, malaise and

general pains; nausea and vomiting may occur and sweating is common. The temperature rises rapidly and may reach 104°F . (40°C .) upon the first day. In children the disease may be ushered in by a convulsion.

The pulse is rapid (one hundred and ten to one hundred and thirty or more). Jaundice is not infrequent and severe nausea and vomiting and cerebral symptoms as headache and vertigo may be observed. The spleen is enlarged and sensitive to pressure. There may be herpetic vesicles upon the lips and petechiæ or mottling of the skin may be noticed; sudamina are often present in great numbers.

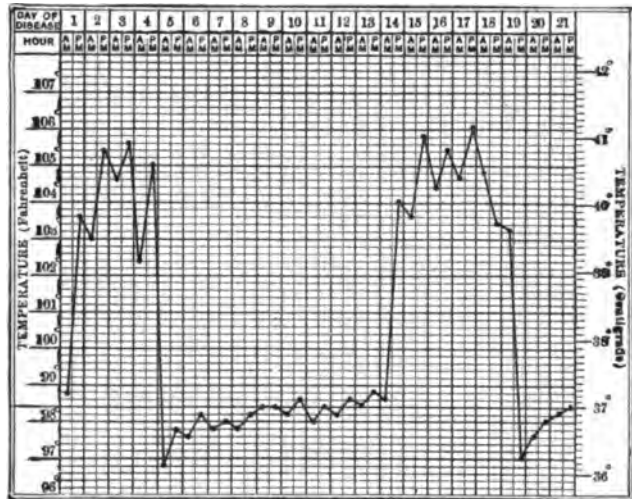


FIG. 3. Clinical chart of relapsing fever.

The liver may be palpable. During the paroxysm the blood contains the spirochætæ. The leukocytes are often increased in number, particularly a polymorphonuclear leukocytosis.

After the fever has lasted about seven days it falls by crisis in a few hours to normal or below this point and with this fall there is profuse perspiration, sometimes diarrhœa or nose-bleed, and a general amelioration of the symptoms. Within a few hours, or at most a day or two, the patient is apparently well. The crisis may occur as early as the third day or as late as the tenth. In the aged or in weak individuals it may be associated with collapse.

After about one week and usually on the fourteenth day from the invasion, the paroxysm is repeated, being ushered in by one or more chills, the fever recurs and the other symptoms reappear. The relapse is, as a rule, shorter than the primary paroxysm and is terminated by crisis in the same manner. After another afebrile interval there may be a second, and following this a third relapse. Rarely has a fourth been observed. Each succeeding relapse

is shorter than its predecessor. At times there is no relapse, the patient recovering after the first crisis. Convalescence, while usually rapid, may be much protracted in patients who have been weakened by severe types of the infection.

Complications such as acute nephritis with hæmaturia, hæmatemesis, rupture, and infarct of the spleen causing peritonitis, dysentery in some epidemics, paralyses, and obstinate ophthalmia may occur. In females, if pregnant, abortion usually takes place.

Prognosis. The disease is not very fatal, the mortality being usually about five percent.; death, however, may take place during the paroxysm in aged and feeble patients or as a result of pneumonia.

Diagnosis. The differential diagnosis from enteric fever and from malaria, the two diseases with which relapsing fever is most likely to be confounded, may be made by examination of the blood. Specimens should be taken from a finger-prick, spread thinly, and may be examined fresh or stained with various aniline colors. Typhus fever and smallpox must be excluded. It may possibly be mistaken for yellow fever or even Weil's disease if jaundice should be present.

Treatment. Pending definite conclusions as to methods of infection, isolation of the patient, and the precautions usually ordered against infectious diseases should be employed. No drug has yet been found which exerts any influence upon this disease; a serum has, however, been elaborated from the blood of infected horses, the use of which has been attended with good results. Since Novy and Knapp believe that active immunity follows recovery from this infection and passive immunity can be produced by the injection of recovered or hyper-immunized blood and both kinds may persist for months, it is probable that a method of prophylaxis and therapeusis may be developed which can be employed for the human subject. Quinine, arsenic, and phenol have not been shown to be of use. The treatment in other respects is symptomatic. The patient should be kept in bed during the paroxysms and should be exposed as little as possible during the intervals, lest a relapse be induced. At the onset a mercurial purge should be given and followed by a saline. Throughout the disease the bowels should be kept open and the kidneys active. The temperature should be controlled by hydrotherapeutic measures and the pains by small doses of the coal tar analgesics. Patients in whom the pain is marked and distressing may be allowed small quantities of the powder of ipecac and opium or morphine. In enfeebled patients the early exhibition of stimulants, especially alcohol and strychnine, is necessary. Emesis may be controlled by pellets of cracked ice, sips of iced champagne, small doses of cocaine, or the hypodermatic administration of morphine should this become unavoidable. Rubbing the limbs with chloroform liniment will relieve the pains.

The diet during the febrile paroxysm should be entirely of fluids, while

during the remissions easily digestible and nourishing solids may be allowed. During the progress of convalescence the patient should receive general tonic treatment.

YELLOW FEVER.

Synonyms. Febris Flava; Bilious Remittent Fever; Typhus Icteroides; Typhus Tropicus.

Definition. Yellow fever is an acute infectious, non-contagious disease characterized by a febrile paroxysm which is followed by a short remission which in turn is succeeded by a relapse. It is often accompanied by jaundice, albuminuria, and a tendency to hæmorrhages, especially into the stomach.

Ætiology. This disease prevails endemically in certain tropical cities and, according to Guiteras, these zones of infection may be recognized: (a) The focal zone, from which yellow fever is never absent, including Vera Cruz, Rio de Janeiro, and other Spanish-American ports. (b) The perifocal zone or region of periodic epidemics, which includes the tropical ports of the Atlantic coasts of America and Africa. (c) The zone of accidental epidemics, between the parallels of 45° north and 35° south latitude.

Yellow fever is seldom seen far from the sea-coast or at an altitude greater than one thousand feet. It is a disease of the summer months, disappearing with the incidence of frost, and is prone to attack cities, especially in their most thickly populated and unsanitary districts. Males seem to be more subject to infection than females, and the disease attacks all ages except young infants. Negroes and mixed races seem to be less prone to the affection than whites, possibly because, during their continued residence in regions where the disease is endemic, they may have suffered from an abortive and unrecognized type of infection. Immunity is usually but not always conferred by one attack.

The specific cause of yellow fever, which is in all probability a micro-organism, has not yet been isolated; several observers have described organisms which they have considered to be the specific germ, but their observations have not been confirmed.

The chief, and very probably the only, mode of transmission of yellow fever is through the bite of a species of mosquito, the *stegomyia fasciata*. Rigid experiments have shown that the disease is not conveyed by means of fomites. That the infection may be transmitted to a non-immune by injection of blood drawn from yellow fever patients has also been proven.

Pathology. The skin is of ictteroid hue, although jaundice may not have been marked *ante mortem*, and subcutaneous extravasations of blood may be present. The blood-serum contains hæmoglobin resulting from the destruction of the red blood cells. The heart may be the seat of fatty

degeneration. The liver is enlarged and congested, later it undergoes fatty changes and is yellowish-brown in color. Spots of necrosis are usually present. The kidneys are enlarged, congested, and the seat of acute inflammation. Areas of necrosis may occur in these organs as well as in the liver. The gastric mucosa is congested and swollen, there may be submucous hæmorrhages and the organ may contain blood-serum and degenerated blood pigment (black vomit). There may be general enlargement of the lymph nodes, particularly those of the peritonæum, of the neck and axillæ. Changes characteristic of yellow fever alone have never been noted.

Symptoms. The incubation period is from three to four days, rarely over five days. Prodromata are rare, the invasion being usually sudden with chilly feelings, or convulsions in the case of children, followed by severe headache, usually frontal, general pains, frequently more marked in the back, prostration, and fever. The onset usually takes place between midnight and dawn. The temperature soon reaches 102° to 105° F. (38.9° to 40.5° C.). The face is flushed, the eyes are injected and watery, and photophobia is present. The pulse is weak and at first rapid in proportion to the height of the temperature; after a day or two, even though the fever is higher than before, the pulse rate, especially with the appearance of jaundice, begins to decrease and gradually continues to do so until it may become slower than normal before the fever declines. This lack of proportion between the pulse rate and the height of the temperature is characteristic of this disease and is an important diagnostic point (Faget's sign).

The skin is hot and dry, the tongue is red and cracked, and the throat and gums may be sore. Nausea and vomiting may appear at the invasion but are more likely not to occur until the second or third day. In severe infections the vomitus may be of coffee-ground material, tar-like, or even of unchanged blood, while in milder forms it consists merely of blood particles, mucus, and bile. The bowels are usually constipated but the stools are not clay-colored. With slight variations in temperature this, the first stage of the disease, lasts three or four days and is terminated by the return of the temperature by lysis to normal.

At this time the *second stage*, or stage of calm begins, the symptoms disappear, and in mild cases convalescence becomes established. In the severe infections this stage, after lasting from a few hours to a day or two, merges into the *third stage*.

In this stage, although rarely there may be no fever, the temperature rises again while the pulse rate may decrease to even as low as sixty. The jaundice becomes more pronounced, the tongue is dry, brown and cracked, and nausea and vomiting return. Hæmatemesis with abdominal pain is frequent, there may be tarry stools and hæmorrhages from the nose, gums, uterus, kidneys, and into the skin. There may be suppression of urine with death from uræmia, or the patient may grow progressively weaker and die of the

profound toxæmia, the fever remaining elevated until this has occurred. In more favorable instances after a secondary fever of two or three days, the temperature falls by lysis, the symptoms ameliorate, and the patient goes on to a protracted convalescence during which jaundice may be persistent.

Albuminuria is a feature of this disease, appearing even in mild infections,

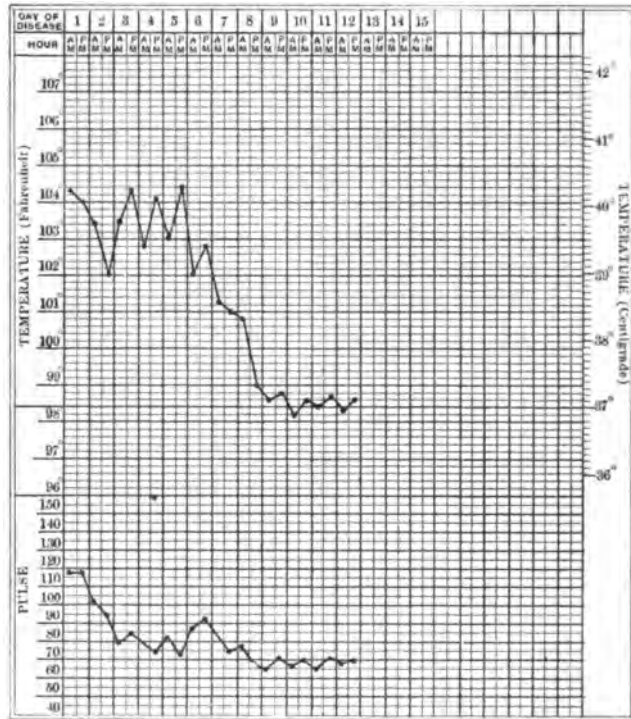


FIG. 4.—Clinical chart of yellow fever showing the pulse typically slow in comparison to the height of the temperature.

on the second or third day. It may be merely transitory, but in severe infections it is present in large amounts and is accompanied by casts. At times the nephritis may result in anuria and death from uræmic poisoning.

Relapses sometimes take place; complications are not very common; such sequelæ as parotitis and multiple abscesses have been observed.

Diagnosis. This may at times be difficult. Malarial fever of the remittent type may be differentiated from yellow fever by the earlier incidence of the remission, the longer duration of the chill, and the presence in the blood of the malarial parasite in the former disease. In the differentiation the three salient characteristics of yellow fever are aids, these being the typical facial expression, slow pulse, and early occurrence of albuminuria.

These points are serviceable in the separation of the disease from dengue as are also the hæmorrhages and the early occurrence of jaundice in yellow fever in contradistinction to the absence of the former and the possible later incidence of the latter in dengue.

Prognosis. This is grave, the severer forms of the infection being particularly fatal. Even if the infection is apparently a mild one, it must be guarded. In weak, poorly-nourished, and alcoholic subjects the chances of recovery are less than in those in whom the opposite conditions obtain. Of patients who exhibit the "black vomit" by no means all die, but those profoundly poisoned and in whom mental and kidney symptoms occur seldom recover. The mortality varies from ten to twenty percent.

Prevention. This consists in the guarding of patients suffering from the disease from the bites of mosquitoes, in the obstruction of ways of ingress of the mosquito to the house, of the destruction of these insects within dwellings, and of the employment of means with a view to prevent their propagation. How effectually the disease may be prevented is evidenced by its rarity in Havana, where it formerly prevailed largely, since proper steps have been taken in prophylaxis. Mosquitoes in dwellings may be destroyed by means of sulphur or tobacco, but better and more pleasantly by pyrethrum fumigation, and may be prevented from entering by means of screens. Patients suffering from the disease should be surrounded by netting. Although the most recent observers believe that yellow fever is not transmitted in any other way than by the mosquito and that disinfection of clothing, bedding, and the like is unnecessary, it may be wise to employ the usual disinfection methods of the sick-room and its contents after the patient's recovery.

Preventive inoculation has not been employed with success.

Treatment. The patient should be isolated and screened. He must be strictly confined to bed from the onset and should be moved as little as possible. The bowels and bladder must be evacuated at the outset by one drachm (4.0) sodium sulphate every hour until five or six doses are given and while the patient is in the recumbent position and, should it be impossible to urinate under these circumstances, catheterization must be undertaken. All body and bed linen must be kept scrupulously clean, and when these are changed the utmost care not to disturb the patient in the least degree must be observed. Food and medicines, when taken by mouth, should be given by means of a spouted cup or through a tube, so that the head need not be raised. After the saline has acted a hot mustard footbath should be given and the patient covered with blankets until free perspiration is induced. This lessens the headache, relieves the nausea, and tends to prevent the congestion of the kidneys. In addition they may be mildly stimulated by one of the alkaline diuretics and the skin kept active by means of tepid sponge baths. During the febrile stages it is wise to feed entirely *per rectum* and to

administer medication by means of this channel or hypodermatically. For the temperature and nervous symptoms hydrotherapeutic measures are indicated. Cool sponging is perhaps best, and the baths should be given with great care so as to disturb the patient as little as possible. If perspiration be not induced spirit of nitrous ether in drachm doses (4.0) every hour in iced water is useful. The pain may be relieved by means of small doses—five grains (0.30)—of acetphenetidine (phenacetine) combined with caffeine sodio-benzoate one grain (0.065) if there is the slightest tendency to cardiac weakness. While most authorities advise the hypodermatic administration of morphine if the pain is severe, certain observers, whose experience of the treatment of yellow fever has been considerable, consider this drug contra-indicated at all stages of the disease; quinine given *per rectum*—twenty grains (1.30)—is useful in this affection. Formerly this drug was extensively employed in yellow fever, and while it is probable that it exerts no specific effect its administration does no harm. Vomiting is difficult of control and should be treated by pellets of cracked ice. Small doses of cocaine—one-quarter grain (0.015)—of hydrocyanic acid, of creosote, or of phenol have been recommended, but ice alone usually accomplishes all that is possible. Hæmorrhage may be combated by the hypodermatic administration of ergot or by means of calcium chloride, forty grains (2.60) *per rectum*. The latter drug is believed to cause an increased coagulability of the blood. Lead acetate and iron perchloride have been advocated but are probably better omitted.

During the course of the disease the kidneys and the circulatory system may be stimulated and the toxæmia lessened by high rectal irrigations of hot—110° to 116° F. (43.5° to 46.5° C.)—normal saline solution. Two of these may be given daily and the quantity should be at least one gallon (4 litres). The uræmic symptoms respond very favorably to this means of treatment; here also hot baths and packs are useful. If at any time there are symptoms of cardiac weakness, free hypodermatic stimulation by means of alcohol, strychnine, digitalis, camphor and ether, or camphor and oil are indicated. Undoubtedly the more effective means is half an ounce (15.0) of a good dry champagne every hour which allays nausea, checks vomiting and is slightly diuretic. Collapse may be treated by this means, by the hypodermatic or intravenous administration of considerable quantities of normal salt solution and by enemata of strong black coffee.

During the stage of remission the patient's strength must be supported by means of stimulants and tonics.

The following treatment of the disease has been recommended. Sodium bicarbonate seven grains (0.5) and mercury bichloride, one-sixtieth of a grain (0.001) are given dissolved in ice water every one or two hours, depending upon the severity of the infection; the sodium bicarbonate tends to lessen the excessive acidity of the gastric juice and urine and, by



rendering the latter alkaline, the tendency to nephritis and anuria may be diminished. It is likely that the alkali is of more importance than the mercury for excellent results have been obtained by the employment of Vichy water alone or combined with sodium bicarbonate. At the invasion the patient is given a hot mustard foot bath and for the following three or four days cool sponges are given, an ice bag is applied to the head and a sinapism to the epigastric and lumbar regions. No food is given during the first three days of the disease.

The serum treatment of yellow fever, although the subject of much experimentation, has as yet yielded no very favorable results.

During convalescence the patient should be kept in bed until the profound prostration which is a feature of yellow fever has disappeared and until the heart and kidneys have returned to their normal action, he should be kept at rest. Tonics such as iron, strychnine and quinine should be prescribed.

The food during the febrile stages should be administered wholly *per rectum*, nutrient enemata such as those suitable in gastric ulcer being indicated (*see p. 386*); during the remission fluids may be given by mouth and, after convalescence has become established, the greatest caution must be observed in feeding. No solids should be given for at least ten days after the symptoms have subsided and too large quantities at a time must be avoided. The first foods allowed by mouth are peptonized milk, milk with or without Vichy, kumyss, or matzoon, one drachm (4.0) every half hour, later beef juice may be given, then the whites of eggs, the infant foods, broths and gruels. Gradually the various semi-solids, junket, cereals, milk toast, etc., may be added until finally the patient is able to tolerate solid diet.

As soon as the patient is removed from his room it should be thoroughly sealed and fumigated with pyrethrum one pound (480.0) to each four thousand cubic feet of air space. After six hours the stupefied insects should be collected and burned.

INFLUENZA.

Synonyms. Epidemic Catarrhal Fever; Grip.

Definition. An acute infectious disease, generally endemic and from time to time occurring in widespread epidemics, characterized by catarrhal inflammations of the various mucous membranes, prostration and a tendency to involvement of the nervous system.

Etiology. At various periods of the world's history since the sixteenth century widespread epidemics of this disease have occurred, the last of these in 1889, when within a year it had prevailed in most parts of the civilized world. Since this epidemic, in most American cities, there are seen yearly a number of instances of epidemic influenza. Epidemics remain in a locality

from one to two months and the affection is prone to attack a very large proportion of the population, and differ greatly in severity and in liability to complications. The specific factor in the causation of this disease is the influenza bacillus which was discovered by Pfeiffer in 1892. It occurs in great numbers in the nasal, tracheal and bronchial secretion of patients affected and may be easily demonstrated so long as it is purulent.

Epidemic influenza is markedly contagious and rapid in its spread, and occurs with its greatest degree of severity in the colder seasons of the year. Unhygienic surroundings do not seem to affect its incidence; it attacks all ages and both sexes and those who have suffered from one infection seem more prone than others to a second.

Authorities differ as to the portal of entry of the contagium, probably, however, it reaches the organism upon the inspired air and the infection takes place through the respiratory tract. It is also asserted that the primary lodgment of the bacillus may be the gastro-intestinal tract or the conjunctiva.

Pathology. This disease is characterized by no typical lesions; only those due to the complications are found *post mortem*. In the abdominal type of the infection there may be enlargement of the solitary and agminated follicles of the intestine.

Symptoms. The incubation period is from one to four days, although, at times, the interval between the entrance of the contagium into the body and the manifestation of the symptoms may be longer.

The onset is usually sudden with a chill followed by a rise in temperature—101° to 104° F. (38.4° to 40° C.)—severe headache and marked bodily pains; nausea and vomiting, together with the other symptoms usual at the beginning of an acute infection, and very pronounced prostration may be present. The fever lasts from two to six days and may be of remittent or intermittent type; in certain instances the elevation of the temperature and marked prostration may be the only symptoms and rarely the patient may exhibit a continuously high temperature lasting for several weeks and which closely resembles that of enteric fever; the pulse is rapid and may, in severe types of the disease and in the aged, become feeble. During the course of the disease various skin eruptions, erythematous or even purpuric, may appear and simple pharyngitis or even tonsillitis may be present. As the temperature approaches the normal at the termination of the disease, sweating may occur and the symptoms gradually subside.

The disease manifests itself in one of several types which are very prone to merge into one another.

(a) *The catarrhal type* is characterized by symptoms referable to the mucous membranes of the respiratory tract and conjunctivæ. At the onset the symptoms of coryza, with sneezing, nasal discharge, a feeling of fulness in the head, sore throat, hoarseness and conjunctival injection, are present. In the milder instances of the disease there may be no further symptoms, but

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more often there is bronchial inflammation, with cough, at first dry, later with muco-purulent and sometimes very copious expectoration; rarely the sputum is dark and blood-stained. Various pulmonary complications may ensue.

(b) *The nervous type* begins with severe headache, pains in the bones and joints and extreme depression and prostration; rarely there may be convulsions. In some instances there are symptoms resembling those of meningitis, such as photophobia, hypersensitiveness to sounds, pain in the back of the head and stiffness of the neck and even delirium may be present. The nervous symptoms gradually subside after a few days but during convalescence there is a marked tendency to mental depression and neuralgia in various parts of the body.

(c) *The gastro-intestinal type* is evidenced by extreme prostration, nausea and vomiting at the invasion, or abdominal pain, distention and diarrhœa; the symptoms may be so severe as to suggest appendicitis or peritonitis. Jaundice and splenic enlargement may be present.

Complications and Sequelæ. Of these one of the most common and serious is pneumonia due to the influenza bacillus alone or to a mixed infection. It is rarely if ever of the lobar form, usually being catarrhal or lobular, and is frequently fatal. Abscess and gangrene are not very uncommon. Pleurisy is not a common complication but when it occurs is likely to become purulent.

Bronchietases may occur. Circulatory complications may appear. Pericarditis is rare; less so is endocarditis which may be of malignant type. In a few instances the influenza bacillus has been grown from the vegetations. Myocarditis may occur and functional cardiac disorders, such as palpitation, irregular heart action, bradycardia and tachycardia are frequently met. Sudden cardiac failure may cause death. Thrombosis and phlebitis have been observed.

Peritonitis, cholecystitis and septicæmia are rare sequelæ; nephritis and orchitis have been noted.

Complications referable to the nervous system are not infrequent and among them may be mentioned encephalitis, meningitis—the bacilli having been demonstrated in the fluid withdrawn by lumbar puncture—cerebral abscess, myelitis, neuritis of various types, and paralyses. Mental disorders such as melancholia or even dementia may occur. Optic neuritis and iritis have been described; otitis media and dizziness, due to affection of the labyrinth, are possible consequences. Mastoiditis is a serious and fairly common complication which may appear as late as apparent convalescence. Routine tests for this affection should always be carried out.

It is of the utmost importance to keep in mind the fact that an attack of influenza is very prone to render any latent disease active and to increase the intensity of any slight organic affection that may be present.

Diagnosis. During an epidemic this is usually easy and may be confirmed when doubtful by the detection of the causative bacillus in the mucous discharges. Severe prostration out of proportion to other symptoms and greater than the signs will account for always is suggestive.

Prognosis. This is usually good. Death may take place from the complications, particularly from pneumonia which is more fatal when due to this cause (twenty to forty percent.).

Treatment. The prevention consists in the avoidance of exposure to cold and wet during epidemics and of association with patients suffering from the disease. Isolation of patients should be carried out whenever practicable and the sputum and nasal discharges should be disinfected and destroyed. When influenza is prevalent it is well to practise spraying of the oral and nasal cavities with some mild antiseptic such as the official liquor antisepticus.

So long as we are ignorant of any specific agent which will abort an attack or mitigate the severity of the infection we must formulate a treatment for each type of the disease.

In treating the respiratory form of epidemic influenza we should first bear in mind the fact that the prostration, fever and systemic disturbance are out of all proportion to the extent or severity of the disease as evidenced by physical signs; secondly, that, granted a moderate involvement of respiratory area or even a disease stationary so far as extent of tissue is involved, this is no guarantee as to prognosis in an individual case. The logical deduction from this observation is that we are dealing with an infectious process in which prostration is marked and in which supporting treatment is urgently needed. The patient should be kept in bed, while the fever persists, in a room of equable temperature, not too hot, and his diet should be of fluids and as nutritious as possible. The bowels should be opened by means of repeated fractional doses of calomel followed by a saline. If the patient's temperature must, in the physician's opinion, be lowered this may be effectually accomplished by means of the application of an ice water coil placed over the heart or by sponging with cool water. In most instances the fever may be allowed to run its course undisturbed. Antipyretic drugs, for their influence upon this symptom should not be given because of their effect upon the heart. The use of morphine for the pain is likely to interfere with nutrition, dam up the excreta and leave the patient in worse condition than before its employment.

The treatment of the respiratory system consists first in relieving the irritation of the nose and throat by means of a spray of ten drops (0.65) of eucalyptol, ten grains (0.65) of menthol to an ounce (30.0) of albolene. One of the alkaline antiseptic sprays should be first used in order to dissolve the accumulations of mucus as much as possible and render the mucus membranes clean in order that the full soothing effect of the oily spray may be evidenced.

The bronchitis necessitates the administration of an expectorant which does not disturb the heart. Here we may give ammonium carbonate in doses of from five to ten grains (0.30 to 0.65) and repeated as frequently as the condition may require, each dose to be given in two ounces (60.0) of milk. The exhibition of this drug will relieve unnecessary coughing, will remove much of the oppression of the chest, will fortify the heart and has the single disadvantage of being prone to disturb the stomach after five or six days.

If the ammonium carbonate is not well borne, strychnine, either as good-sized doses of tincture of nux vomica or strychnine sulphate or nitrate, should be administered. By the strychnine not only is a stimulant effect exerted on the heart muscle and respiratory center, but also an improvement in nutrition due to the drug's action on the spinal cord is brought about. In administering alcohol the previous habits of the patient and the urgency of the symptoms must be considered; usually the patient is better without it.

When the physical signs and clinical symptoms indicate that pneumonia is present the patient should be bled from the less into the greater circulation by the nitrites—preferably glyceryl nitrate in doses of one one-hundredth to one-fiftieth of a grain (0.0006 to 0.0012)—and increasing and frequently repeated doses of strychnine must be administered until convalescence takes place. In slowly resolving pneumonias and for an obstinate bronchitis which persists into convalescence, no drug yields better results than creosote carbonate, thirty or forty drops (2.0 to 2.65) given in a wineglass of good sherry several times a day.

In order to eliminate the toxins of the disease the skin, bowels and kidneys must be kept active. The pains may be treated by the means described below.

In the gastro-intestinal form of epidemic influenza the pain, nausea and vomiting require relief. At the onset of the infection the bowels should be thoroughly evacuated by calomel given in frequently repeated small doses (gr. $\frac{1}{2}$)—(0.016). Later intestinal antiseptics may be accomplished by the administration of the organic bismuth salts, the naphtholate, five to ten grains (0.30 to 0.65), the iodophenolphthaleinate, five to ten grains (0.30 to 0.65) or the subgallate, ten to fifteen grains (0.65 to 1.0). High intestinal irrigations of normal saline solution at a temperature of 116° F. (46.6° C.) are great aids in the elimination of toxins, not only by the bowels but by the kidneys as well. Frequently rectal alimentation becomes necessary when the stomach is unable to retain even liquid food.

In the nervous type the distressing pain particularly calls for treatment and, while quinine has been much lauded, the author considers that the results obtained hardly warrant its administration to the extent that the severe infection would seem to justify. Euquinine seems to be somewhat more efficient, although the statements made that it causes tinnitus are incor-

rect. Its dose is from five to fifteen grains (0.30 to 1.0). The giving of the coal tar analgesics has the disadvantage that the drugs of this class that are sufficiently analgesic are also to a greater or less extent cardiac depressants; consequently their unrestricted employment is by no means advisable, and may be even dangerous. It is possible, however, to relieve the pain of influenza to a considerable extent without dangerously depressing the heart or respiratory system. This may be accomplished by alternating acetphenetidine, of which the untoward effects are neutralized by combination with caffeine, with acetanilide and methyl salicylate, or with antipyrine salicylate (salipyrine), a combination of antipyrine and salicylic acid. Of this ten grains (0.65) may be given every two or three hours until the pain is relieved. Depression may follow the use of this drug in certain instances, and it should always be employed with caffeine in consequence. Kryofine may also be used as an analgesic in doses of from five to eight grains (0.30 to 0.50) and may prove more effective and less depressant than most of this series. Gelsemium often will afford great relief from the headache and backache which are common in this disease. It should be pushed until slight ptosis appears, when the limit of its physiological activity has been reached. This drug merits a trial, since the success, when attained, is brilliant, although it is difficult to furnish exact indications for its administration. At times the muscular pains, if limited to the back, may be mitigated by means of a local application of the official cataplasma kaolini. This should be spread in sufficient thickness over the painful area, a layer of thin muslin being placed over the skin, covered with another layer of muslin, and kept hot. It is cleanly, retains its heat for some time, and is easily renewed. The meningeal symptoms should be controlled by the use of the ice helmet and the application of cold to the back of the neck.

Elimination of the toxins of the disease, as has been previously stated, should be safeguarded. The neutralization of the infectious material in the intestine should be brought about as has been already shown. Diarrhœa, if present, should be considered beneficial. Warm baths relieve the muscular pain and, when accompanied by friction, keep the skin in good condition and add to the comfort of the patient. Not only should the presence of albumin and casts in the urine be determined but the specific gravity, the urea excretion, and above all the quantity of urine passed should be carefully noted. For urinary insufficiency no better treatment exists than continuous enteroclysis with normal salt solution at a temperature of 116° F. (46.6° C.); this not only aids renal elimination but is a cardiac stimulant of considerable efficacy.

The treatment of influenza in children is practically identical with that of the disease in adults; doses should, however, be regulated in accordance with the age of the patient.

Complications should be treated as when occurring independently.

During convalescence the patient should avoid too early exposure to outdoor air and any possible risk of re-infection. Before going out for the first time the temperature should have been normal for from five days to a week. Nourishing diet and tonics, such as codliver oil, iron, strychnine, and the vegetable bitters, should be prescribed.

NASHA FEVER.

Synonyms. Nasa Fever; Nakra Fever.

Definition. An acute, infectious, febrile disease characterized by nasal congestion and localized swelling of the septum nasi, described by Fernandez in 1894.

Etiology.—This affection occurs in certain districts of India. Adults are most commonly affected, the disease being rare in children and old persons. It is observed chiefly in summer and is predisposed to by lack of proper nourishment, unhealthy mode of life, and unsanitary conditions. Its specific cause is not known, although it has been considered that it resembles somewhat influenza.

The facts that quinine does not influence its course and that the hæmatozoön of malaria is not ordinarily found would indicate that it is not of malarial origin, although it generally occurs in such districts. It is probably not contagious.

Symptoms. The characteristic manifestations of this disease are a peculiar hyperæmia of the nasal mucous membrane and swelling of the septum in particular. It is ushered in by malaise, occasionally with chill, prostration, and general pains in the head, body, and limbs. The fever lasts about five days, is seldom high, and there may be a general eruption of small pinkish-red spots. The febrile movement, which, generally remittent but may be intermittent, coincides in time with the eruption and some bronchial symptoms, and gradually falls when the nasal symptoms subside.

Diagnosis. This presents no difficulty. On account of the pains in the neck which may be severe, tuberculous meningitis must be considered.

Prognosis. A fatal issue, preceded by delirium, has been observed in rare instances. Immunity is not conferred by an attack.

Treatment. This consists in employment of the means indicated to control like symptoms occurring in other infectious fevers, as rigorous employment of salines followed by diaphoretics. Opium may be necessary for the pain. The nose should be sprayed every two hours with iced water, or with astringent solutions as tannic acid or silver nitrate, or possibly with a ten percent. solution of cocaine. If these fail, puncture of the septal tumor may be necessary.

DENGUE.

Synonyms. Breakbone Fever; Dandy Fever.

Definition. An acute, infectious disease occurring in warm countries, characterized by severe pains in the joints and muscles, fever, and in most instances by an erythematous eruption.

Ætiology. This disease occurs chiefly in hot climates and during the warmer and more moist seasons of the year; it is common in the East and West Indies, but is seldom seen in the United States except along the coast of the Gulf of Mexico. An epidemic occurred in Texas, in 1879. One of the affection's distinctive features is its rapidity of diffusion and its proneness during epidemics to attack nearly all persons exposed. While probably due to infection with a micro-organism, the specific cause of the disease has not yet been definitely isolated. It is probably not transmitted through contact with patients or by means of fomites, the most approved theory of its means of transmission being that certain mosquitoes, especially *Culex fastigans*, may carry the infection from one person to another.

Pathology. Little is known of the *post mortem* changes occurring in this disease, deaths being very rare.

Symptoms. The onset of the disease is sudden, without marked prodromata, and after an incubation period of from two to five days. The invasion is marked by a chilliness or possibly a rigor followed by a rise in temperature, headache, the ordinary symptoms of beginning febrile disease, and severe pains in the muscles, bones, and joints. The latter become hot, painful, red, tender, and sometimes swollen. It is this joint involvement which gives the affection the name "dandy fever," the gait being so modified that it is supposed to simulate that of a dandy or even it may be so severe that he is unable to move. The rise in temperature is rapid, its maximum being from 103° F. to 106° or 107° F. (39.5° to 41° or 41.5° C.). In two or three days, usually in two, the fever falls rapidly by crisis, with diaphoresis, diarrhoea, diuresis, and epistaxis. With the initial rise in temperature an erythematous rash appears which disappears synchronously with the fever. With the fall in temperature the patient feels much improved although weak; the pains are diminished, but to some extent persist. After an afebrile period of from two to four days the temperature rises again with a return of the severe pains. The temperature is usually less high than in the preceding paroxysm, but the pains may be more marked. With the fever a roseola appears, first upon the backs and palms of the hands and spreads thence over the entire body. The macules are dark red, circular, and about the size of a pea; they may be elevated and are likely to be particularly in evidence about the joints and may coalesce. As the eruption fades, which takes place first upon the hands and arms, then upon the body and finally upon the legs, there is a fine desquamation. The entire duration of the disease

Pain is
not relieved
when eruption
appears

1. The first part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom. It is shown that the structure of the atom is determined by the laws of quantum mechanics, and that the structure of the atom is determined by the laws of quantum mechanics.

is about seven or eight days; at the end of this time the rash has usually faded and rapid convalescence ensues. In certain instances, however, this may be protracted and the patient meanwhile suffers from more or less fever, from vague pains in the joints and feet, and mental and bodily weakness. Relapses are not uncommon. Immunity from a second attack may not last more than a year.

Lymph gland enlargement may be observed and the eruption may persist for several weeks after apparent recovery has taken place. Delirium sometimes accompanies the fever and muscular atrophy has been noted consequent upon an attack. Complications are rare.

Diagnosis. In epidemics of the disease this is not difficult; isolated instances, however, may be confounded with acute articular rheumatism and other infectious diseases. The fact that it occurs in extensive and rapidly-extending epidemics and is attended by an eruption and articular pains, if borne in mind, will obviate error.

Prognosis. Dengue is almost never fatal in patients of moderate power of resistance. Death may occur as a result of other infections such as pneumonia, to which the patient is predisposed on account of the weakening effect of the primary disease.

Treatment. Isolation, unless for persons suffering from tuberculous or renal diseases, in the light of our present knowledge of the probable mode of transmission of the disease, need not be insisted upon, but the access of mosquitoes to the patient should be prevented. Disinfection, also, would seem to be unnecessary.

Absolute rest in bed is an essential until the termination of the second febrile stage. At the onset the bowels should be opened by means of fractional doses of calomel followed by a saline, and throughout the disease the emunctories should be kept active by the means suggested under the section upon the treatment of influenza. The fever seldom needs special treatment on account of its short duration, but in instances of hyperpyrexia (105° to 107° F.)—(40.5° to 41.5° C.) cool sponging or one or two tub baths may be employed. These should be given according to the methods set down for use in enteric fever. Cold applications to the head are much appreciated by the patients.

The pains may be controlled by the employment of the means indicated in those of influenza; sodium salicylate or acetyl-salicylic acid, fifteen to twenty grains (1.0 to 1.30) every two or three hours until the desired effect has been produced, are also useful in the management of this symptom. Tincture of gelsemium is said to relieve the pain and to lessen the cardiac excitability; eight drops (0.50) may be given every three or four hours until the pain is relieved or until the depression of the pulse rate and the incidence of ptosis indicates that the physiological limit has been reached. Opium is seldom necessary for the pain. Excessive nervous symptoms

may be controlled by means of the bromides. In a word the treatment of this disease is entirely symptomatic, no specific having yet been discovered.

The diet during the fever should be entirely fluid. During convalescence tonics should be prescribed and strength-giving foods given in digestible form.

CHOLERA.

Synonyms. Cholera Asiatica; Cholera Algida; Epidemic Cholera; Cholera Maligna.

Definition. An acute infectious disease caused by a specific micro-organism and characterized by emesis, violent purging, abdominal cramps, and collapse.

Ætiology. This disease for many years has been endemic in India and from time to time becomes epidemic. Epidemics have also occurred in other parts of Asia, in Egypt, and in Europe, whence it was first brought to America in 1832. Since that time the disease has visited this country at intervals, the last time being in 1892 at the time of a general Asiatic and European epidemic, but did not pass the quarantine of New York City.

The disease is met in all ages and both sexes, but children and old persons seem most prone to acquire the infection. Cholera occurs more frequently in low lying districts near the sea coast than in higher inland regions, it is more common in warm countries and prevails during the summer months in the temperate zones. The contagium is usually killed by the incidence of frost. Over-population, unsanitary surroundings, bad personal hygiene, intemperance, and any influence which tends to reduce the resisting power of the human body predispose to the infection.

The specific cause of Asiatic cholera is the common bacillus of Koch which was discovered in 1884. It is found in the intestines of all persons suffering from the disease, is usually accompanied by the colon bacillus and often by the streptococcus. It is given off from the body in the dejecta. Rarely is it found in the vomitus. The disease is the result of the growth and propagation of the bacillus in the body.

Mode of Infection. The bacillus of cholera is taken into the gastrointestinal tract in drinking water or upon food. The disease is not contracted by association with patients although by handling the patient's discharges the hands may become contaminated and in this way the contagium may be transferred to the mouth. Vessels washed in contaminated water, vegetables washed or watered with water containing the bacillus, or food upon which flies, which have previously come in contact with infectious matter, have alighted, may transmit the disease. The bacilli are quickly killed by drying, consequently it is hardly probable that they may be taken into the system upon the inspired air; they are capable, however, of living upon bread, meat, and other foodstuffs for from six to eight days. The severity of the infec-

(Cocaine)

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depends upon the amount of the contagious matter taken into the system and upon the resistance of the individual. It is known that the gastric juice is decidedly inimical to the bacillus and individual immunity has been observed, virulent cultures having been isolated from the stools of healthy persons.

In direct opposition to Koch's theory of the propagation of cholera is that of Pettenkoffer who holds that the micro-organism of the disease develops in the soil-water of the East during the warm months and rises thence as a miasm into the air. He asserts that conditions favoring its development are a low-ground water, associated with porosity, moisture and organic contamination, particularly sewage.

It is not certain that one attack of the disease confers immunity.

Pathology. On gross inspection the body is usually much emaciated, the skin over the non-dependent parts is grayish in color while that over the dependent portions of the body is livid or mottled.

Post mortem rise in temperature may occur and, while *rigor mortis* is an early manifestation, contractions of the muscle of the jaws, the eyes, or of the limbs may be observed. The subcutaneous tissue when cut is dry, owing to the fact that the body liquids have been drained away, and the blood is thick and dark. The peritonæum is dry and sticky, the intestines are congested but not distended. The stomach may contain a turbid liquid resembling rice-water; its mucous membrane is congested and its vessels are distended, the epithelium may be eroded or intact. The lining of the small intestine is usually congested and the cavity of the bowel contains turbid serum (rice-water material); in the later stages the hyperæmia is more apparent and the solitary and agminated follicles may be swollen; rarely they may be ulcerated. Ecchymoses and denudation of the mucous membrane may be observed, the latter probably having taken place after death. Patches of false membrane may be found in the intestine in infections of prolonged course. The comma bacillus is found in the contents of the bowel and in its mucous membrane.

A condition of acute parenchymatous degeneration (cloudy swelling) obtains in the liver and kidneys, the former may also show areas of fatty degeneration and the latter coagulation necrosis with desquamation of the epithelial lining of the uriniferous tubules. The spleen is not enlarged and may be decreased in size.

The heart is dry and flaccid. The left auricle and ventricle are empty while the right are filled with dark liquid blood. The lungs may be shrunken and bloodless, except at the bases posteriorly, where they are likely to be the seat of passive congestion.

Symptoms. The incubation period is from two to five days after which the invasion of the disease occurs. The symptoms may be grouped in three stages which are more or less distinct.

(a) *The stage of preliminary diarrhœa.* This stage may be sudden in its onset or preceded by abdominal pain, malaise, headache and emesis. The diarrhœa is painless, the stools are frequent, fluid, yellowish or of "rice-water" type and are alkaline. They contain the comma bacillus and other micro-organisms; there is usually no rise in temperature. This stage lasts from a few hours to a week or more or may be absent.

(b) *The stage of collapse* is characterized by a profuse "rice-water" diarrhœa, the movements being very frequent, and apparently forcibly expelled. Paroxysmal pain and tenesmus may be present but the patient is more often distressed with painful muscular cramps in the limbs and abdominal wall. Thirst is marked and emesis is profuse, fluid resembling the stools being vomited incessantly and in great quantity. The patient rapidly becomes exhausted, and often sinks into a condition of collapse with sunken eyes, shrunken features, pallid face, cold and clammy extremities. The surface temperature may sink 4° or 5° F. (2° to 2.5° C.) below normal while the thermometer indicates a rectal temperature of 103° to 104° F. (39.5° to 40° C.). The pulse becomes rapid, feeble and perhaps imperceptible at the wrist, the heart sounds are markedly weakened. Respiration continues until death supervenes in a condition of coma. At times the patient may remain conscious until the very end. The continued depletion of the patient during this stage results in great diminution of the secretions, particularly the urine and saliva; the sweat glands and, in nursing women, the secretion of milk remain unaffected. Microscopical examination of the stools reveals the presence of mucus, epithelial cells, numerous bacteria, together with the comma bacillus, and at times blood cells. Chemically the dejecta contain albumin, and the salts of the blood, particularly sodium chloride.

Cholera sicca is the term applied to this disease when vomiting and diarrhœa are absent.

The usual duration of the stage of collapse is from twelve to twenty-four hours although it may last but three or four hours.

(c) *The stage of reaction*, if the patient survives, sets in at the termination of the stage of collapse and is characterized by a reappearance of the secretions, of bodily warmth and of normal facial expression. The skin may retain its mottled appearance for some days or an erythema may appear. The symptoms gradually ameliorate, the heart action becoming stronger; the vomiting and purging gradually diminish and the patient either may recover, there may be a recurrence of the diarrhœa and collapse followed by death, or he may pass into a state termed *cholera-typhoid* which is characterized by delirium of a low typhoid character with tremor and *subsultus tendinum*, heart weakness and dry brown tongue. From this he may recover or death may take place in coma which is attributed to uræmic poisoning.

Mild instances of cholera, which are termed *cholerine*, are often seen during epidemics. In such there are characteristic diarrhœa, vomiting and

100

Evaculation
passed useful
in Balkan
War

abdominal cramps, but the collapse is not well marked. Malignant infections may also be observed in which death takes place before the appearance of the purging and emesis, or in which the patient dies early in the disease, comatose and in a profoundly toxæmic state.

Such complications and sequels as nephritis, chronic enterocolitis, diphtheritic inflammations of the mucous membranes, mental and physical debility, and conditions due to septic poisoning, such as parotitis, erysipelas and multiple abscesses may occur. Pleurisy, bronchitis and pneumonia have been observed.

Diagnosis. In the differentiation of Asiatic cholera from other conditions such as cholera nostras, mushroom poisoning, ptomaine poisoning, early stages of trichinosis and pernicious malarial fever which may likely be confounded with it, the chief points to be kept in mind are the history of association with other instances of the disease, the presence of "rice-water" stools, the presence of painful cramps in the extremities, the occurrence of cyanosis, collapse and suppression of the secretions, especially the urine, and, lastly, the presence of the comma bacillus in the dejecta. A preponderance of these symptoms is not likely to occur in any disease except true cholera and, of course, the presence of the comma bacillus is pathognomonic.

Prognosis. The mortality varies in different epidemics from thirty to eighty percent. The disease is more likely to prove fatal in the debilitated and intemperate than in those of better power of resistance. Patients with marked and early collapse seldom recover.

Prevention. This consists in the prompt isolation of all patients afflicted with the disease and the thorough disinfection of all dejecta and the utensils, bed and personal linen of the sufferer. It should be remembered that patients who have survived the attack may continue to discharge the bacilli for fifty days. While the comma bacillus dies quickly if dried, it may live for many months in water or damp fabrics or wet soil. The methods applicable in enteric fever (*see* p. 15) will be found efficacious in this disease. During epidemics all water and milk used for any purpose should be boiled and it is even unwise to eat uncooked fruit or vegetables. The disease is as slightly contagious as is enteric fever and consequently if proper precautions are taken, those associating with patients are not likely to become infected. The digestion should be kept in perfect order and any disturbance, particularly if associated with diarrhœa, promptly treated; here opium, lead acetate, small doses of sulphuric acid and the salts of bismuth, particularly those which exert an antiseptic action upon the digestive tract such as the subgallate, the naphtholate and tetraiodophenolphthaleinate, are indicated.

The protective inoculation against cholera by means of Haffkine's virus has proved effective in the hands of its originator and its employment produces no evil after-effects. Since, however, we have simpler means, namely, through disinfection, sanitation and efficient quarantine, by which the disease

may be prevented, we may await the further research which will doubtless establish an anticholera inoculation which shall be absolutely protective.

Treatment. The patient should be immediately isolated and put to bed. During the first stage of the disease treatment should be directed toward the diarrhoea, to the destruction of the bacilli within the intestinal tract and the neutralization of their toxins. Of the drugs most commonly used to check the diarrhoea, opium and sulphuric acid may be mentioned. It is probable that the latter is to be preferred, while opium is to be reserved to relieve the pain; for this purpose it should be given hypodermatically in the form of morphine. A full dose, one-fourth to one-half of a grain (0.015 to 0.030), may be given at first, to be followed by smaller doses as indicated. Sulphuric acid has a destructive effect upon the comma bacillus and may be given in the form of the dilute acid, ten to fifteen drops (0.65 to 1.0), every two or three hours. The acid may be given alone or with the camphorated tincture of opium. Hydrochloric and nitrohydrochloric acids are also useful.

Excellent results have been attained from the use of phenyl salicylate in cholera; it may be given in doses of five to fifteen grains (0.30 to 1.0) every two or three hours, alone or combined with considerable doses of one of the bismuth salts, either the naphtholate or the iodophenolphthaleinate, these last being among the most effective intestinal antiseptics at our disposal. Calomel has also given good results, not only in controlling the vomiting, but since a portion of this drug is changed in the digestive tract into mercury bichloride, it has an antiseptic effect in addition. It may be given in dosage of from five to seven grains (0.30 to 0.50) at the onset of the disease and continued in smaller doses—one-third to three-fourths of a grain (0.02 to 0.05)—every two or three hours during the first and second stages of the affection.

If severe vomiting is present we may attempt its control by lavage of the stomach and small doses of cocaine—one-fourth to one-half of a grain (0.015 to 0.03). When this symptom is very marked we should administer all medication hypodermatically. In the control of the diarrhoea external applications are often useful; either mild mustard pastes or turpentine stupes may be employed. For the heart weakness the administration of alcohol and strychnine or of camphor, dissolved in ether or sterile oil, one grain (0.065) every six or eight hours, is indicated.

During the second stage, the abdominal cramps may be relieved by hypodermatic injections of morphine and the body heat should be maintained, in this as well as in the algid stage, by means of hot water bottles and, if sweating is a prominent symptom, by the subcutaneous administration of one one-hundredth of a grain (0.0006) of atropine sulphate which may check this distressing manifestation.

The continuous depletion of the system by the serous diarrhoea results in marked thirst and serious diminution in the watery elements of the tissues.

Endothelium

^a

Hydrostatic pressure

↳ isotonic salt
solution

swell up

Rogers' hypertonic
intravenous

& permeable
by
mouth

1. The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present and for the development of a sound policy for the future. The author points out that the study of history is not only a means of acquiring knowledge, but also a means of developing the ability to think critically and to make sound judgments.

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The thirst may be relieved by allowing small but frequent draughts of water, either plain water, barley water or carbonated water being permissible, and by intestinal irrigations of hot normal saline solution. Water may be supplied to the tissues and the organism stimulated by means of hypodermatoclysis or intravenous injection of considerable quantities of normal saline. As much as two quarts (2 litres) may be given under the skin every four or six hours. It is often wise to begin the hypodermatoclysis in the early stages and to continue it at intervals throughout the disease. During the algid stage the bodily heat may be kept up by immersing the patient in a warm bath.

The patient may receive for hypodermatoclysis, instead of normal saline solution, an artificial serum composed of one drachm (4.0) of sodium chloride and forty-five grains (3.0) of sodium carbonate to the quart (litre) of sterile water. This should be injected at a temperature of 104° F. (40° C.) by means of a fountain syringe or irrigating glass to the tube of which a long needle of moderate calibre is attached. The solution should be put under the skin of the buttocks, thighs or back; it is well to avoid the tissues of the neck lest œdema of the glottis be induced. The injection treatment, also recommended, has been followed by excellent results and consists in irrigating the large intestine, through a soft rubber rectal tube passed as high as possible, with an infusion of chamomile flowers, one thousand parts, acacia, fifteen parts, tannic acid, five parts, and laudanum, one part. According to the originator of this treatment the tannic acid not only exerts its astringent action but also inhibits the growth of the comma bacillus and has a neutralizing effect upon its toxins. The solution is passed in under gentle pressure, the bag containing it not being elevated more than eighteen inches or two feet above the patient who lies upon the left side with the buttocks raised. The fluid should be retained as long as possible and it is said that under favorable conditions it may pass the ileocæcal valve and come in contact with the lining of the small intestine. The injection may be given four times a day and in severe infections may be administered after each movement of the bowels. If the patient is in a state of actual or threatened collapse the solution should be hot, but should there be tendency to hyperpyrexia it may be cool. The temperature of the fluid in its receptacle if it is to be given hot should be 112° to 116° F. (44.5° to 46.5° C.) since by the time it has reached the body much of its heat will have been lost in its slow passage through the tube. The tendency to urinary suppression is also lessened by the hot irrigations and may be still further combated by means of hot applications over the lumbar region.

During the stage of reaction the substitution for the tannic acid mixture of solution of sodium chloride, ten to fifteen percent., is advisable and when the tissues seem still to be in need of water, as evidenced by thirst and relaxation of the skin, the hypodermatoclysis should be continued at increasing

intervals. Stimulants may also be necessary. When convalescence has become established the patient should be still kept at rest and fed with the greatest caution lest the diarrhoea recur. The food should be given at frequent intervals but in very small amounts and must be of the most non-irritating character. Peptonized milk is the first nourishment and may be followed by other peptonized foods. Later more liberal feeding may be permitted and tonics should be judiciously administered.

Complications should receive appropriate treatment.

MALARIAL FEVERS.

Synonyms. Chills and Fever; Fever and Ague; Paludal Fever; Swamp Fever.

Definition. Malarial fever is an infectious disease occurring in several types: (a) intermittent, in which the febrile paroxysm is quotidian, tertian, or quartan; (b) continuous with remissions; (c) pernicious; (d) chronic malarial cachexia (Paludism).

Ætiology. This disease is less common in the very young and in aged persons than in young and middle-aged adults; it occurs more frequently in the white than in the negro race and is most prevalent in low lands especially in damp and swampy districts along the sea coast. It is more frequently observed in the tropics and the warmer portions of the temperate zones. In the latter the affection is rare in the spring, most of the instances occurring in the late summer and autumn. In the tropics it is most common in the months corresponding to the spring and fall.

The specific cause of the malarial infections is a micro-organism, the *hæmocytozoon*, *hæmatozoön* or *plasmodium malariae* as established by Laveran in 1880. The *hæmatozoön malariae* is a parasitic body developing within an organism of all the varieties of *anopheles*—the common mosquito—and is transmitted to man through the sting of this insect. The parasite circulates in the blood of man, the intermediate host, and occurs in three forms, each causing a definite and different type of malaria.

The *hæmatozoön* of *tertian fever*, when seen soon after a chill, is a small, hyaline body, rounded or irregular in shape, and is found within the substance of a red blood cell. Its life cycle is of about forty-eight hours' duration, and consists of the following process: It first increases in size, exhibits amoeboid movement, and fine granules of pigment develop within it, while the red blood cell becomes larger and paler in color. The pigment gradually assembles itself at the center of the organism and in about forty-eight hours segmentation takes place. This process consists of the division of the original body which now fills nearly the whole of the red cell into fifteen or twenty spores, resembling the original hyaline body. These are set free in the blood, each in its turn, to prey upon a red blood corpuscle. At this time the chill is

the

manifested. Other fully developed organisms may not undergo segmentation. These are larger than those which sporulate and contain pigment granules in active movement. These are a sexually different type of the parasite. In the quotidian type of the infection there are two sets of tertian or three sets of quartan organisms in the blood which sporulate upon different days causing a chill every twenty-four hours.

The *quartan* variety of the hæmatozoön in its earliest form closely resembles the tertian type but, as it develops, the amœboid movement is more sluggish and the grains of pigment are coarser and their movement is less active. It increases gradually in size, the pigment is seen at its periphery and on the third day its division into radially arranged segments, six to twelve in number, is noted. After a seventy-two-hour interval of development sporulation takes place. Here, as in the tertian type, fully developed bodies may be observed which do not break up. These also represent a sexually different form, the gametocytes.

The *æstivo-autumnal* organism is smaller than the preceding forms and contains less pigment. Its full size may be less than half that of a red blood cell. Early in the disease only small hyaline bodies containing, it may be, a grain or two of pigment are to be found in the peripheral circulation. The more mature forms are usually found in the blood of the viscera, particularly that of the spleen and the bone-marrow, and the corpuscles containing them may be distorted or crenated and are of brassy color.

The characteristic forms of the *æstivo-autumnal* type of the parasite, which are crescent-shaped, ovoid, or spherical, are seldom seen until the infection has been present for a week or more. These contain near their centers groups of coarsely granular pigment. The crescentic and ovoid bodies do not sporulate and represent the gametocytes. The sexual forms of each type of the organism, entering the stomach of the mosquito, when an infected individual is bitten, are fertilized there, and, after developing the spores which result may be transmitted through the insect's bite to a human host and then undergo a further cycle of development.

The complete cycle of development, according to Manson, is as follows: These parasites enter the blood corpuscles as sporozoites which feed on the hæmoglobin, become pigmented, and at maturity develop into (1) schizonts (segmenting or rosette-body) and (2) gametocytes (crescents, spherical body of tertians or quartans). (1) The schizonts, after concentration of hæmozoin (melanin, black pigment), divide into a number of naked segments or merozoites which, on breaking down of the blood corpuscle, escape into the plasma and enter other corpuscles. This completes the endogenous cycle which is *asexual*. (2) The gametocytes or gametes belong to the exogenous or sexual cycle. They are either male (hyaline crescents or spheres) or female (granular crescents or spheres). The male gametocyte emits several microgamites, one of which breaking away impregnates the single macro-

gamete of which the female gametocyte consists. The result is a zygote, which migrating becomes an ookinet and transfers itself from the lumen to the wall of the stomach of the mosquito and becoming encapsulated becomes an oöcyst. It next divides into a number of daughter cells and residual bodies. The cells produce a vast number of minute bodies, the sporozoites. The oöcyst then ruptures and the sporozoites escape into the body cavity of the mosquito, are transferred to the salivary glands, and are injected into the blood of an animal, enter the corpuscles, and becoming schizonts complete the cycle.

Pathology. In acute infections there is a diminution of the number of red cells and hæmoglobin in the blood as a result of the disintegration of the former due to the development of the organism. The spleen is enlarged and may rupture, especially if subjected to traumatism. The parasites are present in the blood.

In pernicious malaria there is marked anæmia, the red cells are distorted and degenerated and contain the parasites within their substance. These are also found in the marrow, and this structure and the spleen may be pigmented and the seat of a marked phagocytosis. The spleen may be only moderately enlarged and is usually dark in color and soft in consistency if the disease is the result of a recent infection. The liver is the seat of acute degeneration (cloudy swelling). If cerebral symptoms are marked the brain is congested and the blood in its capillaries contains numerous hæmatozoa; with severe intestinal symptoms the parasites may be numerous in the capillaries of the intestinal tract.

In malarial cachexia the anæmia is pronounced, the spleen is much enlarged, weighing at times eight or ten pounds, its capsule is thickened, it is slate colored on section, and contains pigment. Its connective-tissue framework is in a state of hyperplasia. A like condition obtains in the liver. Melanin may be deposited in the connective tissue beneath the hepatic capsule. The kidneys may be swollen, contain pigment, and, in some instances, may be the seat of an acute or chronic nephritis. The peritonæum and the gastro-intestinal mucous membrane may be of a slate color due to the deposition of pigment.

Symptoms. The symptoms of the paroxysms of quotidian, tertian, or quartan malaria are practically identical in their clinical manifestation; they occur, however, at different intervals depending upon the time of sporulation of the causative organism. In tertian infection the chill occurs every other day, in quotidian, daily, and in quartan, every seventy-two hours.

The incubation period of malaria is variable; it may be as short as one day or as long as several months; the average being from one to two weeks, probably depending upon the amount of infectious matter introduced into the system.

The paroxysm may be preceded by prodromal symptoms such as indefi-

nite malaise, yawning, headache, or nausea. Prodromata may be wholly absent. The paroxysm consists of three stages, the chill, the fever, and the sweat. *The chill* lasts from one-half to two hours; it usually occurs late in the morning and almost never at night. Its onset is usually gradual, beginning with chilly feelings of increasing intensity until the body shivers with cold and the teeth chatter. Hot water bottles and numerous blankets will not keep the patient comfortable; the face is pinched and pale; the lips are blue, and the patient is apparently very cold; yet, at the same time, the body temperature is elevated even to 105° or 106° F. (40.5° or 41.1° C.). There is severe frontal headache and nausea, and vomiting may be present. The pulse is rapid, tense, and small. The urine is pale, increased in amount, and of low specific gravity, but before this stage it may have been dark colored and

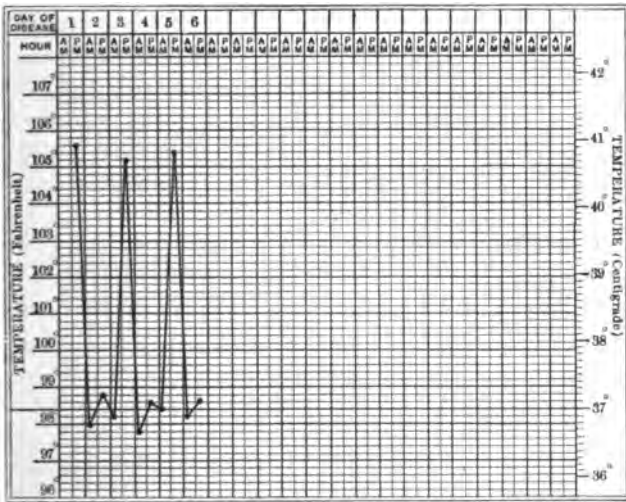


FIG. 5.—Clinical chart of tertian malarial fever.

heavy. At the end of the stage of chill the *febrile stage* begins. This is characterized by flushing of the face, a hot and dry skin, coated tongue, great thirst, severe headache, and pain in the back and limbs; the pulse is full, bounding and rapid, and active delirium may be present. The temperature may be but little higher than during the cold stage, and at times the maximum may be reached at the termination of the chill. The stage of fever lasts from thirty minutes to four or five hours, and is, at the end of this time, followed by the *stage of sweating*. All the symptoms now subside and there is profuse perspiration beginning on the face and gradually involving the skin of the whole body, and the patient falls asleep to awake later feeling perfectly well. This stage lasts one-half to two or three hours. The sweating may at times be very slight.

The duration of the whole paroxysm is from eight to twelve hours, but may be shorter. Splenic enlargement may appear and disappear synchronously with the paroxysm, but in long continued infections this organ usually becomes permanently increased in size.

The intervals between the paroxysms differ with the type of the infection. Thus in simple tertian fever (infection with one set of tertian organisms) the chill recurs at forty-eight-hour intervals. If two sets of this organism, sporulating on alternate days, are present, the paroxysm appears every twenty-four hours. When a single set of quartan organisms is present the seizure takes place every seventy-two hours; if two groups, maturing on different days, are present, the patient will have two paroxysms on successive days, then a day free from chill occurs, and the cycle is then successively repeated. If three sets of quartan parasites are present a chill will occur daily. The chills may appear at nearly the same hour upon different days or they may anticipate—that is, each will occur an hour or so earlier than its predecessor; also the seizures may be retarded, appearing successively at a later hour.

Without treatment the paroxysms may cease after several have occurred or they may disappear after two or three weeks. In these events they are, however, very likely to recur. If the disease continues the chronic form of malaria, followed by cachexia, supervenes.

Æstivo-autumnal malaria, after a period of incubation similar to that of the foregoing types, usually begins with a chill which is more frequently preceded by prodromata than is that of the intermittent types of the disease. They are malaise, general pains, and nausea, often with vomiting of bile. The chill may not be well marked and is followed by a regularly intermittent fever; the intermissions are longer than those of the tertian type, or the paroxysms may be anticipated or retarded, rendering the fever continuous with exacerbations. This form of remittent fever markedly resembles enteric fever; the patient appears prostrated, the pulse is rapid and full, and the temperature rises, with daily remissions, to 102° to 104° F. (38.9° to 40° C.); initial bronchitis may be present, jaundice may be observed, and there is acute splenic enlargement. Nervous symptoms may be noted. The infection varies in severity; it may ameliorate after from seven to ten days; there may be irregular remissions and exacerbations. In severe forms the infection may become of the pernicious type. Here the resemblance to enteric fever is especially marked. The tongue is thickly coated, the facies closely resembles that of enteric fever, and the fact that the two affections frequently occur in the autumn renders the differential diagnosis particularly difficult. Blood examination and the test of quinine treatment are aids in the distinction between the two infections.

Pernicious malarial fever is a result of infection with the hæmatozoön of æstivo-autumnal malaria and occurs in three forms.

(a) *The comatose form* may or may not begin with a chill but in its severest

type this manifestation is usually well-marked (the congestive chill) and accompanying it delirium, or more often, coma, is rapidly developed. The skin is hot and dry and the temperature ranges from 104° to 106° F. (40° to 41.1° C.). The course lasts from twelve to twenty-four hours and may be followed by a second attack. The coma is a result of the accumulation of the parasites in the vessels of the brain and may prove fatal.

(b) *The algid or asthenic form* is characterized at its onset by marked prostration and vomiting; collapse may follow and, though the patient may complain of chilly sensations, no real chill may be present. The surface is cold and the temperature normal or subnormal. The pulse is small, rapid and feeble and the respiration shallow. Marked choleraic diarrhoea and diminished urine, sometimes to suppression, may be noted. These symptoms may continue, slight rises of temperature occurring from time to time, for a few days, at the end of which time death may occur from prostration and the severity of the infection.

(c) *The hæmorrhagic form.* This type includes black-water fever and malarial hæmoglobinuria. It is the result of the malarial toxin although it has been attributed to the use of large doses of quinine; the administration of this drug may, however, aggravate the hæmoglobinuria. Black-water fever occurs in the Southern states, in Central America, in Italy and in Africa.

The condition is met most often in patients who have had frequent attacks of malaria and whose condition approaches that of the cachectic form of the disease. The hæmoglobinuria is usually not accompanied by active malarial symptoms although, preceding its appearance, a febrile movement may have been present for a few days. The cause of the hæmoglobinuria is certainly malaria but whether this manifestation is the result of infection by a distinct type of parasite is unknown. The exciting cause of the paroxysm has also never been ascertained.

Malarial cachexia may result from long-continued exposure to and repeated attacks of any of the types of this disease. Its most prominent symptoms are anæmia and splenic enlargement (ague-cake). The anæmia is characterized by a sallow skin, with sometimes an added subicteroid tinge, coated tongue, disordered digestion and constipation, palpitation and dyspnœa, œdema and coldness of the extremities. The temperature may be subnormal with irregular ascents to 102° to 103° F. (38.9° to 39.5° C.). Hæmorrhages into the retina, or from the stomach and other structures may be observed. The examination of the blood reveals the presence of a typical secondary anæmia, and it may be, the presence of malarial organisms, usually crescentic in form.

The edge of the spleen may extend as low as the crest of the ilium and the consistence of the organ is hard and firm.

Complications referable to the digestive system as enteritis or dysentery, to the urinary system, nephritis, and less commonly to the nervous system,

such as paraplegia, resulting from a peripheral neuritis or deranged circulation in the cord, hemiplegia, acute ataxia and symptoms suggestive of disseminated sclerosis, may occur. Rheumatism is occasionally met with and pneumonia very infrequently is encountered. Areas of cutaneous gangrene and testicular inflammation have been noted.

Diagnosis. This is in most cases easily verified by means of examination of the blood, although special training is necessary in order to become expert in the detection of the more unusual forms of the parasite. Further aids in differential diagnosis are absence of Widal reaction and of leukocytosis and the test of treatment by quinine.

Prognosis. In simple intermittent fever this is favorable. Under proper treatment it is easily curable and in certain instances spontaneous recovery takes place. Continued exposure or insufficient treatment may result in chronic malaria. The æstivo-autumnal type can usually be controlled by proper treatment but may merge into either the pernicious or the chronic type. Pernicious malaria may result in death, sometimes in twenty percent. of the instances, but recovery from malarial cachexia is the rule.

Treatment. The prevention of this disease consists in the employment of means to exterminate mosquitoes, of screens to prevent ingress of infecting insects to dwellings, and in treatment of patients suffering from the disease as well as protecting them from possible mosquito bites, lest the infection be thus transmitted. In malarial regions all exposure to infection, especially after nightfall, is to be avoided. Prophylactic doses of quinine—two to three grains (0.12 to 0.20) three times a day—should be taken by individuals coming to malarial districts.

During the chill, endeavors should be made by means of blankets and hot-water bottles and the administration of hot drinks to keep the patient warm. The headache may be relieved by hot or cold applications. Sponging with cold water may be practiced during the febrile stage and the thirst may be mitigated by frequent drinks of cold water or lemonade. During the stage of sweating the patient may be made more comfortable by drying his skin with hot flannel.

The treatment of intermittent fever consists primarily in the administration of quinine. This drug being absorbed into the blood exerts there a directly poisonous influence upon the parasites present in the same medium. The latter are most susceptible to the effect of the quinine when free in the blood stream, that is, at the termination of the process of sporulation, consequently the drug should be so administered that it shall have been absorbed in time to be present while segmentation is taking place. In order that quinine shall be absorbed quickly and in sufficient quantity, measures should always be taken to render the gastro-intestinal tract—if the drug is to be given by mouth—as active as possible in performing this function, consequently it is wise to clear the intestine, before the administration of the

quinine, by means of fractional doses of calomel to be followed by a saline. Then, in order that the blood shall be impregnated with the drug for an hour or thereabouts before sporulation takes place, it should, when given by mouth, be administered four to six hours before the expected paroxysm. The quantity necessary varies with the severity of the infection and the absorptive power of the gastro-intestinal tract. In the less severe types of the disease fifteen to twenty grains (1.0 to 1.30) are often sufficient while in other instances three or four times this amount may be necessary. For several days following, the patient should receive ten grains (0.65) or more of quinine three times a day, when the dosage may be reduced to five grains (0.30) three times a day. On the seventh day following the last paroxysm an amount commensurate to that administered at the beginning of the treatment should be given and this procedure should be continued every seventh day for about two months. During the first two or three days of the treatment the action of the quinine will be enhanced by confining the patient to bed. After this time he may be allowed up.

The drug may be given in solution, in pill form or in capsules. The solution has the disadvantage of an extremely bitter taste and the advantage of being most readily absorbed. Freshly-made pills or soft gelatin capsules containing the powdered drug are also to be recommended, particularly if their administration is followed by five to eight drops (0.30 to 0.5) of dilute hydrochloric acid to facilitate dissolution. Compressed tablets and stale pills of quinine are very likely to pass through the body undissolved. To patients who cannot take the drug by mouth it may be given hypodermatically in the form of the hydrochloride or of quinine and urea hydrochloride. Either of these may be taken in doses of ten to twenty grains (0.65 to 1.30) every two or three hours.

The following formulæ are useful: \mathcal{R} . Quininæ sulphatis, gra. xv (1.0) acidi tartarici, gra. viiss (0.5); aquæ destillatæ \mathfrak{m} cl (10.0). or \mathcal{R} . Quininæ hydrochloridi, gra. lxxv (5.0); aquæ destillatæ, \mathfrak{Z} iiss (10.0). or \mathcal{R} . Quininæ hydrobromidi, gra. xxx (2.0); aquæ destillatæ, \mathfrak{m} xc (6.0).

Quinine hydrobromide may also be given subcutaneously. The drug may likewise be administered in enemata or suppositories, the rectal dosage being at least twice that appropriate by mouth.

Substitutes for quinine are proposed from time to time and of these quinidine sulphate and cinchonine sulphate, especially the latter, may be mentioned. The doses of these are about one-third greater than that of quinine sulphate. If in long-continued infections quinine fails to exert its usual influence arsenic may be substituted. It may be given in the form of the liquor potassii arsenitis beginning with doses of five drops (0.30) three times a day or as arsenic trioxide, beginning dose one-twentieth of a grain (0.003) three times a day. These doses should be gradually increased until

the physiological effect is evidenced by œdema under the eyes or by gastrointestinal disturbance.

Methylthionine hydrochloride (methylene blue) sometimes succeeds when quinine is not well borne or is contraindicated, as in pregnancy or hæmoglobinuria. Its action is supposed to be exerted upon the parasite in the blood, just as is that of the latter drug. It should be given in capsules containing two to three grains (0.12 to 0.20) each, of which three per day may be taken. The patient should always be warned that the urine becomes blue while this drug is administered.

Æstivo-autumnal fever should be treated along lines identical with those described above. The patient is, however, much more ill and needs careful nursing. In the forms resembling enteric fever he should be kept in bed and receive fluid diet and stimulants, especially strychnine, as indicated. If vomiting is a feature of the infection it is likely to interfere with the administration of quinine by mouth, consequently hypodermatic injections, as described above, may become necessary. Enemata of quinine dissolved in starch water are also useful. The vomiting should be treated symptomatically, the bowels kept active and the hepatic torpor combated by means of calomel. Rectal feeding may be necessary.

Pernicious malarial fever demands the most active and energetic treatment. The patient should be kept in bed and thoroughly cinchonized as quickly as possible by means of hypodermatic injections of large doses. An even more rapid method is that by intravenous injection of the drug. The following solution may be employed: *R.* Quininæ hydrochloridi, gr. xv (1.0); sodii chloridi, gr. i (0.065); aquæ destillatæ, 3iiss (10.0). The most efficient method is the hypodermatic injection of quinine and urea hydrochloride in fifteen grain (1.0) dose.

The cerebral symptoms may be relieved by the bromides or by opium, if necessary, and stimulation by means of strychnine or alcohol may be indicated. The bowels should be kept open; the chills may be relieved by external warmth and the excessive fever by cool sponging.

In giving hypodermatic injections of quinine a long needle inserted deeply into the muscular tissues of the back or buttocks, should be used. Abscesses are very prone to follow and in order that they may be prevented, in so far as may be possible, the strictest aseptic technique should be employed.

Malarial Cachexia. Here quinine is also indicated although not necessarily in large doses, Warburg's tincture containing ten grains (0.65) of quinine to the ounce, often acts well in doses of half an ounce (15.0) three times a day. The administration of extract of ergot in four grain (0.25) doses thrice daily will often result in success when quinine, given alone fails. Cinchonidine sulphate in doses of ten to fifteen grains (0.65 to 1.0) three times a day is also useful. It is in this form of malarial infection that arsenic is particularly indicated; it may be given alone in the form of liquor potassii

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arsenitis or in combination with iron and quinine. The following formulæ are suggested: Quinine in pill form with \mathcal{R} . Ferri et potassii tartratis, \mathfrak{Jss} (15.0); arseni trioxidi, gr. i (0.065); aquæ destillatæ q. s. ad \mathfrak{Jiv} (120.0). Misce et signa, one teaspoonful after each meal; or \mathcal{R} . Arseni trioxidi, gr. $\frac{1}{2}$ (0.003); massæ ferri carbonatis, gra. v (0.30). Misce. Signa. Take one such pill after each meal.

Arsenic may also be given hypodermatically as follows: \mathcal{R} . Sodii arsenatis, gr. $\frac{1}{10}$ (0.006); aquæ destillatæ q. s.; or, \mathcal{R} . sodii arsenatis, gr. $\frac{1}{10}$ (0.006); sodii phosphatis, gr. $\frac{1}{2}$ (0.003); sodii sulphatis, gr. $\frac{1}{10}$ (0.006); aquæ destillatæ q. s.; or, \mathcal{R} . ferri et ammonii citratis, gr. iss (0.1); sodii arsenatis, gr. $\frac{1}{10}$ (0.006); strychninæ sulphatis, gr. $\frac{1}{8}$ (0.002); aquæ destillatæ q. s.

Of these one injection may be given daily. Sodium cacodylate, one-half to two and one-half grains (0.03 to 0.15) daily, may prove useful. In treating this form of malaria, either with or without iron, the bowels should be kept regular; a course of fractional doses of calomel may be indicated from time to time in order to keep the liver active and at intervals mild laxative pills may be employed.

The treatment, otherwise than that discussed above, consists in the employment of all measures, dietetic, hygienic and hydrotherapeutic, to improve the patient's general condition, and removal to a different climate, a mountainous district if possible.

The Treatment of Malarial Hæmaturia. Here, unless active parasites are present in the blood, it is wise to omit quinine but should they be found this drug is strongly indicated. In the milder forms five grains (0.30) three times a day will cause this symptom to cease. Even when no plasmodia are present certain writers advocate small doses of quinine beginning with one grain (0.065) and watching the effect on the hæmoglobinuria. Methylthionine hydrochloride, two to three grains (0.12 to 0.2) three times a day, may be given as also may sodium hyposulphite in doses of twenty grains to one drachm (1.30 to 4.0) three or four times a day. Otherwise the treatment of hæmoglobinuria is symptomatic. The organs of elimination, the skin, kidneys and bowels, should be kept active by means of diaphoretics such as pilocarpine nitrate one-eighth to one-sixth of a grain (0.008 to 0.010) given hypodermatically and with caution, and by hot packs, by high rectal irrigations of hot saline, hypodermatoclysis or intravenous infusion. Stimulant diuretics are to be avoided; cardiac stimulation by means of strychnine and the diffusible stimulants is often necessary.

DYSENTERY.

Synonym. Bloody Flux.

Definition. The term dysentery is applied to a group of infectious inflammatory intestinal affections characterized by ulceration of the intestinal mucous membrane and frequent dejections, associated with tenesmus

and often containing mucus and blood. In chronic forms of dysentery constipation may alternate with the diarrhœa.

The conditions to be included under the term dysentery may be classified as follows: (a) Catarrhal or sporadic dysentery; (b) tropical or epidemic dysentery; (c) diphtheritic dysentery; (d) amœbic dysentery.

Ætiology. Aside from the specific causes of these different types of the disease certain predisposing ætiological factors are common to all forms. Dysentery is especially a disease of warm climates, although its epidemic and other varieties have been observed in northern latitudes. Season also has a distinct influence upon the occurrence of dysentery, the disease being most prevalent during the summer and autumn. Damp low-lying regions near the sea shore suffer more frequently than highland and inland districts. Unhygienic conditions of life, unsanitary surroundings and over-crowding predispose to the incidence of the disease as is evidenced by the epidemics which occur from time to time in army camps, jails, hospitals and the like.

Dysentery affects all ages, both sexes, and all races. Barring the proneness of infants to dysenteric disturbances the disease is most commonly seen in young adults. It is predisposed to by all disorders of the intestinal tract and by errors in diet, particularly the eating of unripe or over-ripe fruit.

Catarrhal Dysentery.

Synonym. Sporadic Dysentery.

Ætiology. This form of dysentery is met as a complication of the various acute infectious diseases as well as of chronic wasting diseases, such as tuberculosis. It is predisposed to by the ingestion of irritating and improper food, and is the type of dysentery met so frequently in children during the summer months. Here it is usually a primary disease, and it may occur as such in adults.

Its specific cause is in all probability the result of the presence and growth in the intestine of the Shiga bacillus (*Bacillus dysenteria*) or analogous micro-organisms of which several varieties may be present in the same patient. In a large percentage of children suffering from diarrhœal diseases prevailing along the Atlantic coast during the summer months, this bacillus, particularly the Flexner-Harris type of it, can be isolated from the intestinal discharges.

Pathology. The morbid changes depend upon the severity of the infection and may consist merely of an increased production of mucus, exfoliation of the epithelial cells lining the large intestine, exudation of serum, and diapedesis of white blood cells. In more marked infections there is swelling of the solitary follicles which is followed by necrosis and ulceration; hæmorrhages from the mucous membrane may occur and this structure may be the seat of a purulent inflammation.

Symptoms. The onset of the disease may be preceded by such prodromata as malaise, abdominal pain, nausea and moderate diarrhœa, or it may

be sudden and marked by a chill followed by a slight or moderate rise in temperature which seldom is higher than 103° to 104° F. (39.5° to 40° C.). The typical symptoms are cramp-like pains in the abdomen accompanied by movements from the bowels with tenesmus. At first these number not more than five to six per day, are copious and consist of fecal matter; soon they become much increased in number, even to one hundred or more per day, are small, mucoid, and at times bloody.

Microscopic examination of the stools reveals the presence of mucus, red blood, and pus cells, epithelial cells which may have undergone partial fatty degeneration, the bacilli of the disease, and the bacteria of putrefaction.

After a week or ten days the stools become less frequent, contain less mucus and blood, and are greenish, due to the presence of bile.

Other symptoms manifested in this disease are a coated tongue, at first moist, later dry, loss of appetite, rarely vomiting, and marked thirst. The patient soon becomes emaciated and a condition of collapse, with small weak pulse and moist clammy skin, may be observed. Occasionally delirium followed by coma and death may be met with.

The usual course is one week to ten days after which the stools begin to approach the normal in number and character, but at times the disease will resist treatment for a long period or even become chronic. Death occurs in rare instances from exhaustion.

Diagnosis. This is to be based upon the character of the stools and the intestinal symptoms. In protracted instances rectal examination should always be made in order to exclude malignant tumor.

Tropical Dysentery.

Synonyms. Epidemic Dysentery; Bacillary Dysentery.

Definition. A specific inflammation affecting the colon and sometimes the small intestine and characterized by the exudation of a false membrane which may be cast off, leaving ulcerating surfaces behind.

Ætiology. This affection is a common disease of tropical and temperate climates and is especially prone to appear where large numbers of persons are gathered under unsanitary surroundings, as in army camps, ships, and hospitals. It often appears in epidemics. Its specific cause is the *bacillus dysenteria* discovered by Shiga during an epidemic in Japan. Other observers have confirmed his observations in the Philippine Islands and in other countries. This micro-organism is not found in the normal intestine but may persist in this situation after an attack of the disease which may account for the dissemination of the infection in regions where it has been prevalent. It has appeared in the United States since the return of our soldiers from China and from the West Indies. Its mode of transmission is by means of drinking water or other contaminated ingesta.

Pathology. The changes observed depend upon the severity of the

infection. In mild forms the mucous lining of the intestine is inflamed, swollen and covered with a croupous exudate which is easily detachable and is composed of necrotic epithelium. In the more severe grades this exudate involves all the coats of the intestine and appears as a grayish or brownish mass of granular surface which may cover the entire lining of the colon or may affect localized areas only. Portions of this pseudo-membrane may be sloughed away, ulcers, varying in extent, being left behind. This disease has been sometimes named diphtheritic dysentery, but the bacillus is not that of Klebs-Löffler. A follicular form of inflammation may occur without membrane formation in which the intestinal lining is at first swollen and congested, the follicles, especially those of the cecum, being inflamed and ulcerated. These ulcers may extend to the muscular coat; their edges are ragged and overhanging. Cicatrization may take place, and ulcerations in all stages may be observed at the same time. In other instances a gangrenous process may follow the so-called diphtheritic inflammation. Here the serous coat is affected and adhesions are common; the wall of the bowel is easily torn, is necrotic and dark olive-green in color with here and there areas which are quite black. Its lining is the seat of diffuse purulent infiltration with localized areas of necrosis and gangrene. Portions of the mucosa may not be involved in the above described types of inflammation but are the seat of simple catarrhal changes.

Symptoms. The onset is usually sudden and may be characterized by a chill. The temperature rises rapidly— 102° to 103° F. (39° to 39.5° C.)—the prostration is marked and cerebral symptoms, even delirium, may be present. The temperature is irregular with remissions from time to time, the pulse is rapid and soon becomes feeble; irregularity of force and frequency may be noted.

There is severe abdominal pain and the stools are frequent, small, dark in color, foetid, and contain mucus and blood. Pieces of pseudo-membrane may be cast off, varying from a small shred to a tube cast of the gut of considerable size. Tenesmus is likely to be a distressing symptom, and the abdomen may be distended and tender. In persistent cases the stools are likely to become serous and more profuse. Such dejecta are markedly albuminous, and may be reddish, due to the presence of blood. The patient becomes rapidly weak and emaciated and suffers from thirst; the mouth is dry and the tongue foul and coated. In severe infections there may be delirium followed by coma. Milder subacute types of the disease may occur in which the symptoms are not marked and the stools as few as five or six per day. Even in these types, relapses may occur.

Complications, such as localized peritonitis, intestinal rupture with subsequent general peritonæal infection, may be observed. Hepatic abscess is less frequent than in amoebic dysentery. Pleurisy, pericarditis, and endocarditis are infrequent complications.

/æ/ (diphthong)

Diagnosis. This may be made upon the rapid development of intestinal and constitutional symptoms, and the appearance of membrane in the dejecta. It is assured by the isolation of Shiga's bacillus from the stools and by obtaining a positive agglutination reaction with pure cultures of this bacillus when mixed with the blood-serum of the patient.

Prognosis. In this type of dysentery this is distinctly unfavorable, recovery may, however, occur or the disease may become chronic.

Diphtheritic Dysentery.

This form of dysentery occurs secondary to the acute infectious diseases, pneumonia, enteric fever, etc., and to certain chronic affections such as endocarditis, nephritis and pulmonary tuberculosis.

Pathology. While termed diphtheritic this condition is not a result of Klebs-Löffler infection. It is characterized by the appearance of a pseudo-membranous exudate of yellowish or grayish color upon the mucous lining of the intestine and by necrotic ulcerative areas. The supporting connective tissue of the colonic glands is inflamed and infiltrated with fibrin and pus cells. The process may involve the muscular and peritonæal coats as well. The inflammation may be confined to the rectum or the whole colon may be involved, its entire surface being covered with the exudate or merely scattered areas of pseudo-membrane being present. In markedly severe instances the necrotic patches may slough leaving ulcers behind which either cicatrize or remain active for long periods. Peritonæal adhesions are frequent.

Symptoms. The onset of this disease is gradual, being characterized by the appearance of slight or moderate diarrhœa, the stools being fluid, not often accompanied by pain or tenesmus, and seldom more than from three to five daily. In mild instances the passage of mucus and blood is rarely observed, but in the severer types of the disease these, with shreds of membrane, may appear in the dejecta. The affection is usually subacute or chronic in its course and is associated with emaciation. Death may take place from asthenia.

Amœbic Dysentery.

Definition. An inflammation of the large intestine characterized by the formation of ulcers and due to the *amœba dysenteriae* (Councilman and LaSueur), but generally known as the *amœba coli*.

Ætiology. This disease is most common in tropical countries but has also been observed in the southern United States and more infrequently in those farther north. It may occur at any age but is most common during the third decade of life and seems to affect males more frequently than females. Its specific cause is the *amœba coli* which is found in the stools, the intestinal ulcerations, and in the pus from liver abscesses which commonly complicate the disease. This organism is from fifteen to twenty microns in

diameter, spheroidal in form, and, when living, actively motile. It is composed of two portions, an outer, the ectosarc, and an inner, the endosarc. It moves by propelling the former, after which the endosarc follows by flowing into the pseudopodia thus extruded. The amœba is phagocytic, taking into its substance red blood cells and other bodies occurring in the intestine. It is said that the virulence of the amœba is much enhanced by the presence of the various pyogenic bacteria.

Its mode of transmission is usually by means of drinking water or upon other ingesta contaminated with infected water, and consequently the disease, of which it is the cause, may be in great measure prevented by proper attention to water supply and by thorough disinfection of the discharges of affected individuals.

Pathology. The intestinal changes are confined almost wholly to the large intestine and are but seldom found in the ileum. The ulceration involves first the submucosa of the bowel, but spreads thence to the mucosa. The muscularis is rarely, and the peritonæal coat still more seldom, affected. The first changes noted are a number of areas of congestion in the submucous coat; these are followed by necrosis of this and a sloughing process, which involves the mucous coat as well, and leaves behind ulcers of varying size and depth. The peritonæal coat rarely shares in the inflammation and perforation is a rare occurrence. Pus is present in surprisingly small amount considering the extent and type of the process, and extensive necrosis of the submucosa may be observed with no or only slight involvement of the mucosa, the inflammation dissecting its way downward and laterally rather than toward the lumen of the intestine. The ulcers may be circular or irregularly oval, they have ragged floors and overhanging edges, and may involve nearly the whole of the colonic lining including that of the appendix. In them the amœbæ are present; these may also be found in the lymph spaces and more rarely in the neighboring blood-vessels.

As the ulcers heal, their bases become covered with fibrous tissue which may later contract and cause strictures or even sacs in which the amœbæ may remain after the patient seems to have recovered. Thickenings and adhesions of the wall of the colon may be observed.

The hepatic lesions are probably the result of the entrance of the parasites into the portal capillaries and are of two types: First, multiple circumscribed areas of necrosis, and second, abscesses, single or multiple. The former lesions are thought to be due to the action of the products of the growth of the parasite, the latter, if recent, contain within their cavities, which are large if single, small if multiple, necrotic matter of semi-fluid consistency and reddish—or greenish—yellow color. On close inspection this is seen to be composed of a spongy net-work of tissue in the interstices of which a viscid fluid is confined. The walls of the recent abscesses are ragged and necrotic while those of long standing are lined by firm, dense fibrous tissue. Micro-

scopic examination of the contents of the abscesses reveals the presence of necrotic liver cells and amœbæ. True pus is not present unless mixed infection has taken place. Such pyogenic bacteria as staphylococci, streptococci, colon bacilli, etc., have been found.

Large single abscesses are usually near the upper or lower surfaces of the right lobe while the small multiple abscesses are scattered through the organ and may be at no great distance from its surface.

Hepatic abscesses may rupture, depending upon their site, into any of the surrounding organs or through the abdominal wall. They may perforate the diaphragm and burst into the lung, whence their contents may be coughed up.

Associated lesions which may be observed are nephritis and cerebral congestion, with or without capillary hæmorrhages.

Symptoms. In cases of acute onset the symptoms are practically those of epidemic, tropical dysentery. The temperature is seldom high, but the patient is greatly prostrated and becomes rapidly and to a marked degree emaciated. Intestinal hæmorrhage or perforation may occur. While recovery usually takes place in two or three months, in severe grades of the infection death may take place within a week or ten days or, the disease becoming chronic, the patient continues to suffer from alternating diarrhœa and constipation, exacerbations occurring from time to time during which the pain and temperature recur and diarrhœa with the passage of mucus and blood makes its appearance. Between the exacerbations the patient enjoys periods of improvement but a recurrence of the symptoms may be brought about by errors in diet or exposure; while often enough the patient's nutrition remains good, in other instances emaciation may be marked.

In another chronic type of the disease the ulceration persists and with it the diarrhœa; the emaciation is progressive and death from exhaustion supervenes within a few months.

Complications. Those to be particularly anticipated is liver abscess, the presence of which is evidenced by an increase in the area of liver dullness, pain, leukocytosis and a temperature of septic type accompanied by chills and sweating. Other possible complications are peritonitis, intestinal hæmorrhage or perforation, pylephlebitis, pleurisy, pericarditis, endocarditis and arthritis. Malaria and enteric fever have been observed in co-existence with this disease.

Diagnosis. This to be based upon the finding of the amœbæ in the patient's dejecta. They should be searched for upon a warmed stage and a positive diagnosis should not be made unless amœboid movement is observed.

Prognosis. In epidemics and without proper treatment this is unfavorable; in sporadic cases the mortality is low. Recurrences are prone to occur. The chances of recovery of the patients in whom the disease is complicated by hepatic abscess are greatly diminished.

Treatment. Under this caption the means applicable to the treatment of all types of the affection will be first discussed, to be followed by a description of those especially indicated in the different forms of the disease.

General Considerations. In all forms of dysentery the prophylaxis consists in boiling all possibly contaminated drinking water, disinfecting and destroying the patient's dejecta and in taking all the other precautions laid down in the section upon the prevention of enteric fever (*see* p. 15). Much work has been recently undertaken along the lines of preventive inoculation against bacillary dysentery and it is quite probable that we may in the not far distant future have at our disposal an effective immunizing serum against the Shiga bacillus infection.

At the onset of any of the varieties of dysentery the patient should be immediately put to bed and if the catarrhal type is the one in hand a purge of castor oil, one ounce (30.0) followed by twenty grains (1.30) of sodium bicarbonate should be given.

The pains and tenesmus may be controlled by the application to the abdomen of turpentine stupes or mild sinapisms and by the administration of Dover's powder by mouth. In instances where these means fail morphine may be given hypodermatically.

The feeding of the patient offers difficulties, for we have a disturbed digestive tract and one which must be irritated as little as possible and at the same time we have to combat a disease, one of the most prominent characteristics of which is loss of strength and emaciation. Milk has its disadvantages since the curds which are formed in the stomach may be impossible of digestion by an alimentary tract the powers of which are impaired; the curds also are excellent culture media for the growth of the micro-organisms which are present in the intestine. Curd formation may be prevented by taking the milk in small amounts and diluted with lime water or Vichy or barley water, or in the form of kumyss or zoolak. Peptonized milk may also be tried; soups and broths may be permitted. When milk is not well borne easily digestible semi-solids, which may be partly predigested by means of pancreatin or diastase, such as soft boiled eggs, meat jellies, milk toast, junket, etc., are allowable.

The diet in the protracted forms of bacillary or amœbic dysentery may be more liberal. While milk plays an important part here, such nourishing and easily digestible solids as raw oysters, cereals, poultry and fish may be given in small quantities and tentatively. As the patient recovers a still more liberal dietary may be gradually permitted.

Various forms of drug treatment may be employed in catarrhal and bacillary dysentery; the so-called saline treatment is indicated particularly in sthenic cases with high fever and in many instances achieves excellent results. Instead of the initial dose of castor oil, a purgative dose of magnesium sulphate or sodium and potassium tartrate is given and the intestine is

thoroughly evacuated. Then, upon the theory that intestinal micro-organisms cannot exist or at least are inhibited in their growth by an acid medium, aromatic sulphuric acid is given in twenty drop (1.30) doses three times a day. By this means, not only are the intestinal bacteria retarded in their development, but the astringent action of the acid is also exerted.

The ipecac treatment may be employed in all forms of dysentery and is to be carried out as follows: The drug is administered into the empty stomach and it may be wise to apply counter-irritation over the stomach in the form of a mild mustard paste or by painting the skin with iodine before giving it. The amount of this drug which is administered is large and under ordinary circumstances would produce emesis, consequently the patient should not be told of what the medication consists and he should be warned not to vomit if he can avoid it. The size of the dose is in proportion to the severity of the disease and weakness is not a contra-indication. Preceding the administration of the ipecac a dose of ten to fifteen drops (0.65 to 1.0) of tincture of opium is given and after a quarter of an hour from fifteen to sixty grains (1.0 to 4.0) of ipecac, depending upon the age of the patient and the type of the infection, are taken. The drug may be given in pill form or suspended in a little water to which a little oil of peppermint or anise oil has been added. Should emesis be induced the dose should be repeated as soon as the stomach is at rest. The ipecac may be given for considerable periods, the dosage being diminished as the dysentery becomes less marked in severity.

Intestinal antiseptics may be employed as advised in the treatment of chronic diarrhoeal conditions (*see* p. 421), but are usually less effective than the forms of treatment described above.

Treatment by means of intestinal irrigations often brings good results. The apparatus necessary consists of a fountain syringe to which a long rectal tube of soft rubber is attached. When the intestine is very irritable it may be wise to pass a soft catheter beside the tube to carry off the return flow and prevent distention of the bowel. Forcible irrigation is contra-indicated, a gentle flow, the receptacle containing the fluid to be used being held at a height not greater than three or four feet above the patient, being preferable. Careful introduction of the tube is necessary and a skilled hand may often succeed in passing the same well beyond the sigmoid flexure. The discomfort accompanying its passage in instances of severe tenesmus may be obviated by the insertion of a cocaine—one-fourth of a grain (0.015)—and iodoform—eight grains (0.5)—suppository shortly before the procedure. The quantity of the irrigation selected may be from one to two gallons (4 to 8 litres) although irrigations so large in amount may at first be intolerable to the patient, we may, by beginning with small quantities, gradually increase until the bowel becomes tolerant and the patient's discomfort endurable.

The insertion, previous to the injection, of such a suppository as that given above or the instillation of a drachm (4.0) of tincture of opium in a little starch water will often render the subsequent irrigation well borne. The temperature of the irrigation is an important consideration, cold irrigations being indicated in sthenic cases while, when stimulation is desirable, higher temperatures are advisable. Tepid irrigations are seldom employed.

Various solutions have been employed in the different types of dysentery. In the simple catarrhal and diphtheritic forms simple cold water, or hot saline solution may be employed. Here also astringent solutions such as alum (2 percent.), zinc phenolsulphonate (0.25 percent.), silver nitrate (0.25 percent.), tannic acid and salicylic acid (one to two percent.), silver protein—protargol—(0.75 per cent.) are of use. An infusion containing forty-five grains (3.0) of ipecac is said to be useful. Those particularly indicated in bacillary dysentery are antiseptics, silver nitrate and protargol in the strength given above, methylthionine hydrochloride ten grains (0.65) to a quart (1 litre) of saturated solution of boric acid, potassium permanganate (0.025 percent.). In amoebic dysentery an approved irrigation is of quinine sulphate, one to five thousand, gradually increased to two to one thousand. Mercury bichloride one to ~~one~~ or to ~~six~~ thousand may be used. Such irrigations consisting of from two to four quarts (2 to 4 litres) are given twice a day. Recently it has been found that irrigations of copper sulphate solution of a strength of one to six thousand or less are very efficient. The irrigations are given twice a day, and the colon having been filled, the fluid is retained for twenty minutes if possible. A preliminary cleansing of the bowel by means of the injection of sterile water is advisable. This water should be allowed to drain away before the medicated irrigation is given. Enemata of ice water are also useful in this type of the disease. Hydrogen dioxide solutions, both in amoebic and bacillary dysentery, may be injected *per rectum* as a parasiticide.

Cases of tropical dysentery are reported as being favorably influenced by drinking sulphur waters, and sulphur in connection with pulvis ipecacuanhæ et opii has been suggested for internal administration; fifteen or twenty grains (1.0 to 1.30) of the former and five grains (0.30) of the latter may be given every four hours. In this form of dysentery excellent results are said to follow the administration of the fluid extract of cortex granati and of *apoloappus balayhuen*, a South American drug and one used there in dysentery.

In dysentery of the chronic type pure olive oil may be tried. It is said to act as a cholagogue, and to decrease the number of bowel movements and the tendency to intestinal fermentation and putrefaction.

Much research has been carried out in the attempt to elaborate an anti-dysenteric serum and while in some instances favorable reports have been made of the results of these endeavors, as yet we have no specific serum

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which is generally relied upon. Shiga, however, by means of a serum obtained from immunized animals claims to have reduced the mortality in endemic dysentery in Japan from about thirty-five to nine per cent.

Before concluding it is well to mention the surgical management of chronic dysenteric conditions. This consists in the formation of an artificial anus through which the bowel may be irrigated. It has been suggested that the appendix, being opened and fastened to the edges of a colostomy wound, may be used in this way. When rectal ulcers exist in subacute or chronic instances they may be opened under anæsthesia, scraped and touched with caustic. They then should be irrigated with warm normal saline solution and, when healed, the employment of irrigations of silver nitrate, one to two hundred and fifty or to five hundred, is advised.

EPIDEMIC GANGRENOUS PROCTITIS.

Definition. An acute infectious, very contagious disease characterized by rapidly progressing ulceration of the rectum resulting, in certain instances, in prolapse and gangrene.

Ætiology. This affection occurs in certain parts of Central and South America, the Philippines and in islands of the Malay Archipelago. Children are more frequently attacked than adults and in Northern South America the latter are not affected. The disease is favored by unsanitary conditions and malnutrition, and marked humidity in a hot climate is probably necessary to its occurrence. It has been attributed to the eating of unripe maize but, since the affection has been reported in regions where this cereal is unknown, this cannot be held responsible for all cases. The essential factor in the ætiology of epidemic gangrenous proctitis is probably a micro-organism, although possibly not a specific one, since by some it is not regarded as a distinct disease but is considered merely a dysentery of severe type, the lesions of which are, for some unknown reason, confined to the colon (the high type) or to the rectum (the low type).

Pathology. The typical lesions of this disease consist of deep ulcerations of the rectal mucous membrane occurring low in the viscus between the two sphincters or higher than this point, even involving the lining of the sigmoid flexure, and covered with a pseudo-membranous exudation. In the severest forms of the affection there is rectal prolapse with gangrene of the extruded portion.

Symptoms. The invasion of the disease is characterized by burning and pruritus of the anal region followed by symptoms resembling those of dysentery. The dejecta are fæcal at first and very foul, later they are mixed with bile and mucus and finally consist merely of blood and mucus which runs sluggishly but constantly from the anus. Tenesmus is present, progressive weakness, even to collapse, is manifested and there are pronounced

cerebral symptoms—delirium or coma. Death in convulsions may supervene, or, the patient surviving, rectal prolapse takes place, the prolapsed portion of the bowel soon sloughing.

The differential diagnosis from dysentery may be made by means of proctoscopic examination. The prognosis of the disease is distinctly unfavorable but even the most severely affected patients sometimes recover. After sloughing of the prolapsed rectum recovery has been observed, the process being analogous to that which takes place in a sloughing intussusception which heals spontaneously.

Treatment. Taking into consideration that this affection is probably due to an infectious process localized in the rectum, the indication for treatment would seem clear, namely, to render this viscus as antiseptically clean as possible. For this purpose injections of mercury bichloride solution (one to six to ten thousand), of hydrogen dioxide solution, of weak creolin, of silver vitellin (twenty percent.), etc., may be employed. The prolapsed rectum should not be reduced but should be cleansed and kept dusted with bismuth subgallate (dermatol), thymol iodide (aristol) or other similar powder. The use of an enema of strong lemon juice mixed with a dilute solution of white rum and water two or three times daily and the dusting of the anus with wood ashes is the native treatment for the disease in Venezuela. Surgical procedures are indicated when gangrene takes place.

TROPICAL SPRUE.

Synonym. Psilosis.

Definition. A disease of tropical countries characterized by a catarrhal inflammation of the entire digestive tract which results finally in glandular atrophy and which is evidenced clinically by an inflamed mouth, diarrhœa, and distention of the intestines with gas.

Ætiology. This disease is common to all tropical climates and prevails particularly in India, Southern China, and the Malayan Archipelago. Authorities differ as to whether sprue is a specific bacterial infection or originates secondarily to the diarrhœal and other wasting diseases, malaria, etc., which are common in the tropics. The fact that no bacterial cause for the disease has yet been isolated is against the former hypothesis. Various microorganisms and intestinal parasites have been considered as causes of the affection but their occurrence is probably a coincidence or they are present as a result of preceding morbid conditions. The *strongyloides intestinalis*, the *amœba coli*, and several varieties of bacilli intermediate between the colon bacillus and the bacillus of enteric fever are frequently found. Predisposing factors to the incidence of sprue are fatigue and over-exertion, pyæmic conditions, the puerperal state, nephritis, and, in fact, any influence which tends to vitiate the bodily power of resistance. The affection usually shows itself

during tropical residence but may not occur until the patient has returned to temperate regions; it may remain inactive in the system for years.

Pathology. The changes found after death from sprue consist of atrophy of the mucous membrane and glandular structures of the small intestine. The latter may be entirely destroyed, but while the intestinal wall is greatly thinned, the peritonæal coat is unaffected. The internal surface of the bowel is generally covered with a thick layer of dirty and tenacious mucus. The agminated glands may be swollen or ulcerated and dysenteric ulcerations may be present in the large intestine. The mesenteric and subcutaneous fatty tissue has wholly disappeared. The parenchyma of the liver, pancreas and kidneys may be the seat of an inflammatory process or of localized fatty degeneration. The mucous membrane of the mouth is eroded, ulcerated and cracked.

Symptoms. The typical manifestations of sprue are sore mouth, irregular diarrhœa and tympanites. The tongue is reddened but seldom coated, it is pointed and shrunken, and tiny aphthous ulcers are often present at its edge and upon its ventral surface. These lesions may also be observed upon the hard and soft palates. The dorsum of the tongue is dry and shining, or it may be the seat of very shallow erosions which may unite to result in a serpiginous formation. Fissures may be present and the patient complains of buccal soreness which is increased upon taking salty or highly seasoned food. Pain on swallowing may be noted, showing that the œsophagus is probably in a condition analogous to that of the tongue.

Emaciation is marked and the abdomen is tensely distended and tympanitic. Eructations are frequent and either gas or watery fluid may make its appearance in the throat as a result of this symptom. The appetite may be excessive or entirely lost. Nausea and vomiting, uninfluenced by eating, may occur. Gastric discomfort and pain often are associated with the flatulence.

The diarrhœa is a characteristic manifestation, the movements varying from one to a dozen in the twenty-four hours. They are large, acid, fœtid, white and frothy, resembling whitewash, and are usually unaccompanied by pain in the acute stage of the disease. If the diarrhœa is chronic there may be only one or more copious movements daily which are pale, pasty, fermenting and foul-smelling. Microscopical examination reveals bits of the mucous lining of the bowel, micro-organisms, and perhaps a small number of red blood cells.

The patient becomes rapidly weak and emaciated as a result of the impairment of assimilation due to the interference with the action of the intestine and the inability to retain food. The skin is sallow and yellowish, and secondary anæmia is marked; the leukocytes are not increased in number. Attacks of tetany have been noted. The course of the disease is chronic with no tendency toward spontaneous recovery, although temporary improvement

may be observed from time to time. The patient may recover unless the mucous lining of the intestine is so atrophied as to render sufficient assimilation impossible. The affection usually lasts for a year or two but a much more protracted course is not rare.

Diagnosis. This is simple when the character of the stools and the history is considered. The mouth lesions often resemble those of syphilis.

Treatment. This is principally dietetic. The patient should be kept in bed, warmly clothed, and the abdomen covered with a flannel binder, and after preliminary thorough evacuation of the bowels by castor oil or rhubarb, fed upon frequently repeated small quantities of milk. The milk should not be drunk, but sipped from a teaspoon or taken through a small glass tube. As rapidly as possible the amount of milk should be increased. Whether the patient is receiving too much is indicated by its appearance undigested in the stools and increase in the soreness of the mouth. In favorable instances after a month or more the buccal symptoms and the diarrhoea will begin to disappear. The exclusive milk diet must be continued for at least six weeks after the cessation of all symptoms. Successes have been reported to have followed a diet entirely of meat or meat juice, and certain observers consider the use of minced meat, five ounces (150.0) three times a day as important. Antiscorbutic treatment has been advised, and a fruit diet, particularly a regimen of berries, is said to have produced rather remarkable cures. Strawberries are reported to have achieved cure in obstinate instances of the disease.

In the control of the diarrhoea the intestinal antiseptics, particularly bismuth, may be employed. The use of santonin, in five grain (0.30) doses twice daily in a teaspoonful (4.0) of olive oil for a week, has been highly recommended. When convalescence has become established, general tonic treatment by means of iron, arsenic and strychnine is indicated.

THE PLAGUE.

Synonyms. Bubonic Plague; Black Death; Malignant Adenitis; The Pest.

Definition. An epidemic inoculable and otherwise communicable febrile disease characterized by swelling and inflammation of the lymph glands and hæmorrhages into the skin and mucous membranes.

Ætiology. The disease is endemic in India and from time to time epidemics have appeared in various European countries. Patients suffering from the disease have been brought to New York and instances of the affection have been observed amongst the Chinese in San Francisco.

The plague is most common during the hot months and is seldom seen in individuals beyond middle life. The chief predisposing factor is lack of proper hygiene, the infection being usually met in crowded and filthy quarters and amongst the poor and ill-nourished.

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The specific cause of the affection is the *bacillus pestis* which was discovered in 1894 by Kitasato and afterward independently by Yersin.

Transmission and Modes of Infection. The contagium of bubonic plague may enter the body through the respiratory or digestive tracts or through abrasions of the skin and is found in the blood of patients and in the pus from the suppurating glands. It is given off in the fæces, urine and sputum and contaminates clothing, bed linen, apartments and the like. It may be carried by fleas and other insects, and by rats, mice, dogs, etc.

Pathology. The skin and the digestive tract are the seat of punctate extravasations of blood which may be so numerous and extensive as to indicate the name, black death. These are also found upon the serous membranes and upon the capsules of the viscera. The latter and the central nervous system are congested. The spleen is enlarged. In the bubonic type of the disease the lymph glands, particularly those of the axillæ and groins, are swollen and inflamed and often undergo hæmorrhage, suppuration, and necrosis. The peri-glandular tissue may be involved in similar changes. In these glands the *bacillus pestis* is found and, after suppuration has taken place, with it other pathogenic bacteria are associated. The lymph system is affected in all types of the disease, but in the bubonic form a particular set of glands will be chiefly involved. In the pneumonic variety the bronchial lymph nodes are especially affected and areas of broncho-pneumonia exist in the lungs. Here the bacilli are found in the sputum.

Symptoms. The disease occurs in two main types, 1. *pestis minor* and 2. *pestis major*. The latter is met in three varieties: (a) The bubonic form. (b) The septicæmic form. (c) The pneumonic form.

Pestis minor, abortive or ambulant plague, is seen usually just before or at the termination of an epidemic. The patient is seldom very ill but is a great danger to the community since his excreta contain the contagium. The attack lasts several days and is characterized by mild fever, and swelling and tenderness of the inguinal glands. Suppuration may occur.

Pestis Major. The incubation period is from two to seven days; during the day or two before the onset of the disease the patient may complain of indefinite malaise, dizziness and headache or general pains. The invasion, which may be without prodromata, is marked by a chill or chilly feelings followed in a day or two by a rapid rise in temperature to 104° to 106° F. (40° to 41.1° C.). The pulse is rapid, and some nervous symptoms and prostration are marked, and the patient may die in collapse. Should he survive, about the third to the fifth day the glandular swellings appear, the inguinal lymph nodes being affected in the majority of cases. These become red and tender and may resolve, suppurate or become gangrenous. Petechial hæmorrhages take place into the skin and there may be bleeding from the various mucous membranes, gastric, intestinal, pulmonary, etc.

In the *septicæmic type* of the infection, sometimes called *pestis siderans*.

the bacilli are found in the blood stream, the patient is profoundly poisoned, there may be no marked elevation of temperature, and he is likely to die before the glandular swelling takes place. The typhoid condition is rapidly developed and hæmorrhages are common.

The pneumonic form of the disease is sudden in onset, with a chill, rise in temperature, cough and pain in the chest resembling those of septic pneumonia. Physical signs of pulmonary consolidation may be obtained, the sputum, is profuse, watery, and contains blood and the *bacillus pestis* in large numbers. This form of plague is very fatal and probably the most infectious form; the patient seldom survives more than three days.

Diagnosis. This may be made upon the appearance of the glandular tumors and upon the occurrence of the bacillus in the excreta and blood.

Prognosis. This is markedly unfavorable; from seventy to ninety per cent. of those afflicted usually perish. The septicæmic and pneumonic varieties are especially fatal. Suppuration of the buboes is a favorable sign while the occurrence of hæmorrhages is the contrary. Relapses do occur, although rarely, and are dangerous to life.

Treatment. *Prophylaxis* consists in the establishment of proper sanitary conditions, the extermination of rats and especially rat fleas, isolation of patients, careful disinfection of their excretions, of bed clothing, apartments, etc., and cremation of the dead.

Much can be done toward immunization since the work of Haffkine and Yersin in the elaboration of protective sera. Of Haffkine's serum the dose is about forty minims (2.50), and by its use, according to reports, the death rate may be markedly diminished and epidemics controlled. Lustig and Galeotti have produced a method of preventive inoculation which does not give rise to such marked reactions as have sometimes followed that of Haffkine.

The treatment of the attack is to a great extent symptomatic. At the onset the bowels should be opened by means of fractional doses of calomel followed by a saline. The nausea and vomiting may be relieved by small doses of dilute hydrocyanic acid, frequently repeated. The fever may be controlled by cool sponge baths.

The coal tar antipyretics should not be given on account of their depressing effect upon the heart. For the nervous symptoms the bromides may be administered, but for these and the pain the hypodermatic exhibition of morphine often becomes necessary. For the tendency to heart weakness and collapse, stimulants such as ammonia, alcohol, strychnine, and camphor dissolved in ether or sterile olive oil, are indicated. The glandular swellings may be treated by means of cold applications, or poulticed. When the presence of pus is manifest they should be promptly incised and drained. The injection into the buboes of mercury bichloride has been employed with good results.

Phenol is recommended and has given excellent results. It is given in doses of ten grains (0.65) every two hours (one hundred and twenty grains (8.0) daily) and when taken well diluted causes no disturbance except possible smoky urine.

Much research has been conducted in the hope of producing curative antiplague serum and at least two antitoxins have been elaborated which are useful. That of Yersin is considered by certain observers to be of great value. Its action is said to be bactericidal, as evidenced by the degeneration induced in the bacilli, and antitoxic as well. In order to achieve the best results the serum should be given in large doses early in the disease, both intravenously and under the skin of the lymphatic area which drains toward the bubo. In mild instances of the disease the latter method will often suffice, but in marked infections the combined method is necessary, the beginning dose being about five to ten drachms (20.0 to 40.0), the intravenous dose varying with the severity of the intoxication. No evil results are reported as due to this treatment.

CLIMATIC BUBO.

Synonyms. Tropical Bubo; Tropical Adenitis.

This affection consists of a non-venereal subacute inflammation of the inguinal glands associated with a remittent fever lasting several weeks. It is observed on the tropical coasts of Asia and Africa, in the Philippines and the Malayan Archipelago, and in the West Indies.

It is prone to affect persons living in close association amid unhealthy surroundings and is met in epidemics. Its chief importance consists in the fact that it may be mistaken for *pestis minor* from which it is bacteriologically entirely distinct. Its ætiology is not definitely known, but it has been considered to be a bacterial infection which effects an entrance by means of abrasions upon the legs or about the genitalia, or by means of the stings of insects. It has also been considered as occurring secondarily to dysentery and chronic malaria.

Symptoms. These consist of unilateral or bilateral inflammation of the inguinal glands or those about the saphenous opening, preceded by a chill, general pains and malaise. A remittent fever follows. The glands increase in size for from three to four weeks when the fever subsides by lysis. The glandular tumors remain for several months and slowly resolve. In a small percentage of cases the tissues about the glands become involved and supuration takes place, the constitutional symptoms under such conditions are marked. If not opened the abscesses tend to spread and finally burst discharging pus. The discharge continues for varying periods, finally ceasing and leaving behind sluggish painful ulcers.

Treatment. This is entirely symptomatic and surgical. Until sup-

uration occurs the buboes should receive inunctions of unguentum Credé, ten percent. ichthylol or compound iodine ointment. If they subside without pus formation, in their declining stages inunctions of mercurial ointment and snug bandaging are indicated. As soon as the presence of pus is apparent, free incision, drainage and dressing with antiseptics are necessary. If this is thoroughly done rapid healing takes place. The ulcers which follow suppuration should be treated in accordance with surgical principles. It is said that calomel dusted over their surfaces will relieve the pain.

DIPHTHERIA.

Synonyms. Membranous Croup; Angina Malignum; Putrid Sore Throat.

Definition. An acute infectious febrile disease characterized by inflammation and the formation of a false membrane in the upper air passages, particularly in the pharynx. The specific disease, diphtheria, is the result of infection with the Klebs-Löffler bacillus. The bacillus was discovered by Klebs in 1883 and isolated and cultivated by Löffler in 1884. To the affections of similar clinical appearance, but of usually milder course, which are not due to this bacillus, the terms diphtheroid and pseudo-diphtheria are applied. Diphtheria has been known since the time of Galen and from time to time has occurred epidemically. Its specific nature, however, was not distinctly proven until the discovery of the *bacillus diphtheria*.

Ætiology. The disease occurs chiefly in children and is rare after the age of sixteen years. It is seldom seen in very young infants especially in those who are breast fed. It is predisposed to by the presence of nasal or pharyngeal catarrh, a poorly cared for mouth and teeth, adenoids and enlarged tonsils, and is most prevalent in the cold and damp months. It appears rather amongst unsanitary surroundings than in healthy districts, although severe epidemics have been observed in the country. Bad drainage and emanations of sewer-gas have never been proven to have any direct influence upon the incidence of the disease and when the infection occurs where these factors are present, save in so far as residence in places exposed to their influence is likely to depreciate the general health and lessen the powers of resistance, they are not causative.

The specific cause of diphtheria is the Klebs-Löffler bacillus, found in the false membrane of the disease and in its growth producing a poisonous substance which is responsible for the constitutional symptoms. With this bacillus other pathogenic bacteria are often associated which may be held responsible for the purulent inflammations which frequently complicate the disease. Of these the *streptococcus pyogenes* is the most important. It is an interesting fact that the diphtheria bacillus may be found in the mouths of healthy persons in whom it causes no symptoms. This fact may be due to a lack of virulence on the part of these bacilli, a natural immunity, or suffi-

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cient power of resistance upon the part of the individual to render them inert.

The contagium is transmitted upon the air or by means of ingested substances and may be received from the membranous exudate or nasal or pharyngeal secretions of patients either actively ill or convalescent from the disease or from persons who have come in contact with sufferers. The disease is markedly contagious for the distance of a few feet but fortunately its contagium is not very diffusible, consequently it is quite possible to confine it to a single room. The contagious material is resistant and of considerable viability and may remain upon clothing, etc., for a number of months.

Previously it has been believed that diphtheria might be conveyed to man by means of contagion from cats, calves and fowls which were affected by a disease of identical causation, but it has been proven that the diphtheria of these animals is a different affection and is not communicable to human beings.

Pathology. The characteristic pseudo-membrane of diphtheria may be found in various situations. Of these the throat, the tonsils, pharynx and larynx, including the epiglottis, are most frequently affected. The membrane commonly occurs upon the nasal mucous membrane, in the trachea and in the bronchi. Less frequent situations are the œsophagus, the stomach, the duodenum, the vagina, the vulva, the ear and the conjunctiva. The nasal accessory sinuses may be involved and the process may extend to the middle ear through the Eustachian tube.

The membrane is first yellowish-white in color, later becoming grayish. Early in the disease it is firmly attached to the underlying mucous membrane and, when detached, leaves abrasions, later it is softer and more easily removed. In extreme instances the mucosa beneath may be gangrenous. The adjacent lymph glands are enlarged and the salivary glands may be swollen.

Similar membranous inflammations may occur in scarlatina, measles, pertussis and enteric fever. These are usually the result of streptococcus infection and are termed diphtheroid.

The diphtheritic membrane is the result of a degenerative necrosis of the mucous membrane. The epithelial cells are infiltrated with fibrin and leukocytes, necrose, and then undergo a hyaline transformation and coagulation. To this process the term "coagulation-necrosis" has been applied. The membrane histologically is composed of coagulated fibrin, necrotic tissue and the diphtheritic bacilli.

The *heart* is frequently the seat of fatty degeneration which may precede a hyaline change in the heart muscle. Endocarditis may be present with vegetations in which the bacilli are found. This latter complication, with pericarditis, is rare.

Broncho-pneumonia is often present; the kidneys are the seat of an acute

degeneration or a true acute nephritis. The liver and spleen are softened and degenerated (cloudy swelling).

Symptoms. The incubation is usually one or three days, rarely as long as a week. The onset is marked by chills, or, in children, a convulsion, followed by a rise in temperature; there are headache, bodily pains, nausea, vomiting and prostration, but in the mild types of the disease these symptoms may be very slight. The temperature is not a marked feature; it rises to 102° to 104° F. (37.8° to 40° C.). The pulse is rapid—one hundred and twenty to one hundred and forty—and is usually small and feeble. Cerebral symptoms are infrequent.

In the *pharyngeal type* there is complaint of sore throat and difficulty in swallowing. The pharynx and tonsils are inflamed and swollen and upon the latter there are yellowish spots which gradually enlarge, becoming grayish in color, until by the third or fourth day the tonsils are entirely covered and the pillars of the fauces and the soft palate may be involved to such an extent that the opening of the pharynx may be wholly occluded. The cervical glands are swollen. In the ordinary infection the patient is not markedly poisoned and the symptoms soon abate. In about a week or ten days the glandular swellings have disappeared with the false membrane, leaving the pharynx clean, the temperature falls and the patient is convalescent.

In *nasal diphtheria* the onset is marked by the usual constitutional manifestations and an increased nasal discharge which irritates and often excoriates the upper lip. The glands beneath the angle of the mandible are swollen and indurated. This enlargement is characteristic and is probably due to the fact that the nasal mucosa is particularly rich in lymphatics. Many instances of nasal diphtheria are of severe type with marked constitutional symptoms and antral, aural or ocular complications are frequent. A peculiar form is sometimes met in which constitutional manifestations are absent, the nostrils are occluded by membranous exudation, which, however, is not so adherent as is usual in diphtheria but in which the bacilli are present. This infection is characterized by a benign course.

Laryngeal diphtheria or membranous croup is characterized by a laryngeal cough at the onset and by the gradual development of obstruction. The latter may, however, appear suddenly at night. The respiration is rapid and difficult, the expiration particularly being interfered with, the abdomen and lower thorax are retracted in inspiration and the mucous membranes and extremities become cyanotic from lack of oxygen. The patient becomes restless and may fall into a semi-coma and die of asphyxia. In milder instances the paroxysm may last but a short time and the patient will gradually become quiet. The attack is, however, likely to be repeated during the following night. At times relief will follow the coughing up of the membrane, in part or as a whole. The constitutional symptoms are often not marked but when there is an accompanying pharyngeal membrane the opposite is usually the case.

Membranous croup occurs in two varieties, the clinical appearances and symptoms of which are so similar as to prevent their differentiation except by bacteriological examination. Cultures alone will determine whether the affection is due to the streptococcus or to the diphtheria bacillus.

Diphtheria in other parts is rather infrequent but the inflammation may affect the conjunctiva, either primarily or by extension through the lachrymal duct, the skin, especially about the lips and nostrils and the external auditory meatus by extension from the middle ear. The genitals may be involved, whence the inflammation may spread to the surrounding skin, and diphtheritic inflammations may occur in open wounds which have been infected by the bacillus.

The symptoms of constitutional infection in mild infections are not marked. In more severe instances, three or four days after the onset, the patient's condition becomes one of great weakness, the heart action is feeble and cerebral symptoms are present. At this time there is great danger of death from paralysis of the heart. In other patients the constitutional symptoms are prominent from the beginning, the temperature is high and the evidence of toxæmia pronounced. As a rule the constitutional symptoms are directly proportional to the local involvement.

A marked leukocytosis is usually present in diphtheria even of mild type and albuminuria occurs in nearly all severe infections.

Complications and Sequelæ. The slight albuminuria, which is so commonly seen, is not to be attributed to nephritis but the appearance of blood and epithelial casts and the occurrence of diminution of the urine indicates that serious kidney involvement is present. Œdema is less frequent than in scarlatina but, while the nephritis of diphtheria usually terminates in recovery, it may cause death. Bronchitis and broncho-pneumonia are important and serious complications. Pericarditis and endocarditis are rare. The heart is often irregular and a systolic murmur at the apex is present in a large majority of instances. Heart weakness, evidenced by rapid and galloping rhythm or by a sudden diminution in the pulse rate, is a serious manifestation. The cardiac symptoms usually appear from the tenth to the twentieth day of the disease but acute dilatation with a fatal result may occur in convalescence, even as late as the seventh week.

Minor complications, such as nasal or pharyngeal hæmorrhage, various skin eruptions and jaundice, are not uncommon.

Paralysis is a most important sequel and is a result of neuritis due to the toxins of the disease. It may appear as early as the seventh day or not until convalescence and as frequently follows mild as severe cases. It occurs in ten to twenty percent. of patients and is more frequent in adults than in children. The palate is most often affected and involvement of this structure is evidenced by nasal voice and the regurgitation of food through the nostrils. The pharynx is anæsthetic. Involvement of the muscles of deglu-

tition is also frequent and various ocular paralyses are not rare; neuritis may occur in the extremities resulting in permanent disability. Recovery usually takes place from these paralyses within a few weeks. Multiple neuritis may be observed which may rarely involve the innervation of the heart and the respiratory muscles, in which event the patient's condition is dangerous.

Diagnosis. This can be assured only by bacteriological examination of the false membrane; fortunately this is not a difficult procedure, and where there is no health department affording facilities for laboratory diagnosis, it may be carried out by the practitioner. For a description of the technique the reader is referred to any good work upon clinical diagnosis.

Prognosis. Since the introduction of the antitoxin treatment this has been rendered vastly more favorable than previous to this event. By this remarkable therapeutic advance the mortality from diphtheria has been reduced from thirty to fifty percent. to from ten to fifteen percent. The prognosis is excellent in the usual infections. Complications and laryngeal involvement render it less good. Sudden heart failure, paralyses and uræmia may result fatally.

Prevention. Prophylaxis in diphtheria has been further developed and is more successful than in any other infectious disease save smallpox. The following condensation of the rules concerning the disease laid down by the New York Health Department covers the subject of prevention very thoroughly.

If possible one person should take entire charge of the patient and no one else except the physician should be allowed in the sick-room. The nurse should hold no communication with the rest of the family, who should not receive or make visits during the illness. Discharges from nose and mouth must be received on cloths which should be immediately immersed in phenol solution (six ounces (180.0) of pure phenol added to one gallon (4 liters) of hot water and diluted with an equal quantity of water). All handkerchiefs, towels, bed linen, clothing, etc., that have come in contact with the patient, after use must be at once immersed, without removal from the room, in the above solution. These should be soaked for two or three hours and then boiled in water for one hour.

The greatest care should be taken in making applications to the throat and nose lest the discharges be coughed into the face or upon the clothing of the attendant. A pane of glass held between the patient and the physician will effectually prevent this accident.

The hands of the attendant should always be disinfected by washing in the phenol solution and in soap and water after making applications and before eating.

Surfaces of any kind soiled by discharges should be immediately flooded with phenol solution.

All utensils used by the patient must be kept for his use alone and must



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not be removed from the room, but must be washed in the phenol solution and in hot water and soap. After use the soapsuds should be thrown in the water-closet and the vessel which contained it washed in the phenol solution.

The sick-room should be thoroughly aired two or three times a day and should be swept frequently, after scattering wet sawdust or tea leaves on the floor to prevent the dust from rising. After sweeping, the room should be dusted with damp cloths. The sweepings should be burned and the cloths and broom soaked in the phenol solution.

When the disease is recognized shortly after the beginning of the illness all hangings and unnecessary furniture should be removed from the sick-room.

After recovery, the patient's body and hair should be washed with hot soapsuds, he should be dressed in clean clothes, which have not been in the room during the illness, and taken from the apartment.

The quarantine should last as long as the diphtheritic bacilli are found upon the mucous membranes; they may persist for six or eight weeks.

The nurse and physician should wear, while in the sick-room, a gown which covers the clothing completely. This should be kept just outside the apartment and should be sterilized directly after use. If the patient, while the throat is being examined, should cough in the examiner's face, the latter should wash the face and hair in soap and water followed by one to one thousand mercury bichloride solution. The hands must always be sterilized upon leaving the sick-room. The nurse should spray or gargle her throat several times a day with a mild antiseptic, such as Dobell's solution.

It is strongly advisable that the nurse and members of the family, if they have been exposed, should receive an immunizing dose (one hundred units for a child under the age of one month to eight hundred units for an adult) of antitoxin, and at the first sign of sore throat a full dose must be given. The personal experience of the author leads him to believe that these doses, especially for the adult, should be multiplied by four. The effect of an immunizing dose lasts about four weeks and at the close of this period a second dose should be given if there is continued exposure.

After removal of the patient the room and its contents should be properly disinfected and aired.

Treatment. The patient should be immediately isolated, especially if the disease is complicated by pneumonia, in an apartment which should be kept at 65° F. (18.5° C.) and freely ventilated. If practicable, and in hospitals it is always better, to assign each patient a separate room than to collect the sufferers in a ward or large room. From the onset of the disease until all possible danger of heart failure is past the patient should be kept in bed. At the beginning of the treatment the bowels should be freely opened by means of fractional doses of calomel to be followed by a saline and regular daily movements should be obtained throughout the course of the disease.

The treatment of diphtheria by antitoxin is attended with such good results and has so few disadvantages and dangers that it should always be employed. All patients in whom the symptoms and clinical appearances resemble those of diphtheria should receive the treatment without waiting twenty-four hours or more to learn the result of a bacteriological examination. By enforcing this rule we may give antitoxin to many patients to whom it is unnecessary, but it is better to do this than to allow one individual who is suffering from true diphtheria to wait even for a few hours.

The antitoxin of any reputable producer may be used and the technique of its administration is simple. An ordinary hypodermatic syringe or the injection outfit provided by the maker of the serum may be used. The needle should be sterilized and the skin of the selected site, which is usually the thigh, buttock, or side of the chest, bathed with soap and hot water, washed with alcohol and one to five thousand mercury bichloride solution. The serum should then be slowly injected, the needle withdrawn and the puncture covered with a bit of sterile gauze held in place by adhesive plaster.

The quantity of the antitoxin administered depends upon the severity of the infection and the age of the patient. After the first injection the dosage should be regulated by the effect produced and is limited by this consideration alone. The most concentrated serum obtainable should be used so that the bulk of the dose should be as small as possible. In mild instances one dose of three thousand units is often sufficient, a unit being the amount required to neutralize one hundred times the minimum amount of diphtheria toxin necessary to kill a small (ten ounce—300.0) guinea-pig; five thousand units is a proper initial dose for a child of two years with a severe infection. All patients with laryngeal involvement should receive a dose at least as large. Late in the disease, when the patient is profoundly toxic, ten thousand units may be given and repeated until the condition is ameliorated. Too great insistence cannot be laid upon the importance of giving large doses in severe infections for it is possible by this means to save seemingly hopeless patients. The treatment is harmless and amounts of over one hundred thousand units have been given. The favorable action of the antitoxin is evidenced, as a rule, within twenty-four hours and often within less time. The membrane ceases to spread and becomes softer and more easily detachable. The surrounding and underlying mucous membrane rapidly assumes a normal appearance. In nasal and laryngeal diphtheria the amelioration of the local inflammation is quite as evident. The glandular swellings diminish and at the same time the constitutional symptoms clear, the temperature falls, the heart action becomes stronger and the prostration is less marked.

It is important to keep in mind the fact that the antitoxin, in order to exert its best effect, must be given early. One should not wait for an assured bacteriological diagnosis, but the treatment should be instituted as soon as

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the patient is seen. The serum is impotent to check such complications as septic infection, nephritis, and broncho-pneumonia.

Unfavorable Effects of Antitoxin. Authentic instances of sudden death have never been reported and the consensus of opinion is that the treatment is harmless. Various skin eruptions, especially urticaria, may follow injection and instances of arthritis and abscess have been reported. The latter are not often seen and, considering the advantages of the antitoxin treatment, are wholly negligible.

Local treatment has become less important since the introduction of antitoxin but still holds a considerable place in the management of diphtheria. The object sought is cleanliness rather than the destruction of the bacilli. In many cases it is difficult of accomplishment owing to the objections of the patient. If the child is prone to struggle it is better not to employ force, and in such patients the local treatment may be omitted. The most approved method is to irrigate the nose and pharynx with mild solutions, such as normal sodium chloride or weak boric acid, as hot as the patient will bear, by means of a fountain syringe or rubber hand syringe to which a soft rubber catheter is attached. The child should lie on his side with the head slightly lower than the rest of the body so that the irrigation can readily flow from the mouth into a convenient receptacle. In severe infections such irrigations should be given every two or three hours.

Nasal syringing is necessary in patients with discharge, with pronounced symptoms and marked nasal involvement. If there is epistaxis the irrigations should be temporarily omitted and sprays of suprarenal extract, ten percent. calcium chloride solution or of weak alum solution may be employed.

In mild infections, when practicable, mild antiseptic alkaline sprays should be used both upon the nose and pharynx. Dobell's solution or the official liquor antisepticus dilute are applicable for this purpose.

Direct applications to the site of the inflammation are less used now than formerly, but many physicians approve of them. The patient should be warmly wrapped and held by the nurse, the mouth being held open by a cork between the teeth or by a mouth gag, while the application is made by means of a cotton swab or a brush. The utmost tact should be employed by the physician, nurse, and by all in contact with the patient, so that it will not be necessary to use force in restraining the patient during the applications. If the child is utterly rebellious the injury to the heart will probably more than compensate for the benefit which is obtained locally. Various solutions may be employed, that originated by Löffler, being one of the most efficient. It consists of menthol ten parts, toluol twenty-six parts, liquor ferri sesquichlorati, four parts, and absolute alcohol, sixty parts. Other solutions which may be used are ten percent. lactic acid; one part of mercury bichloride to one thousand parts of normal sodium chloride solution; mercury

bichloride one part, tartaric acid five parts, water one thousand parts; phenol three parts, rectified oil of turpentine forty parts, absolute alcohol sixty parts; and hydrogen dioxide solution, etc. Such applications may be made to the inflamed surface every three to six hours.

Insufflations of various powders such as bismuth subgallate, thymol iodide (aristol), one part iodoform to five parts sodium bicarbonate may be given, but the disease can be managed very satisfactorily without this form of treatment.

External applications to the throat in the form of poultices are not indicated. Ice bags, however, may lessen both the pharyngeal inflammation and the tendency to enlargement of the cervical and submaxillary glands. Sucking bits of ice often makes the patient more comfortable and may influence the pharyngeal inflammation. In glandular enlargement and tendency to cervical suppuration inunctions of unguentum Credé and injections of antistreptococcus serum are valuable since suppuration in diphtheria is considered to be due to mixed infection with pyogenic micro-organisms.

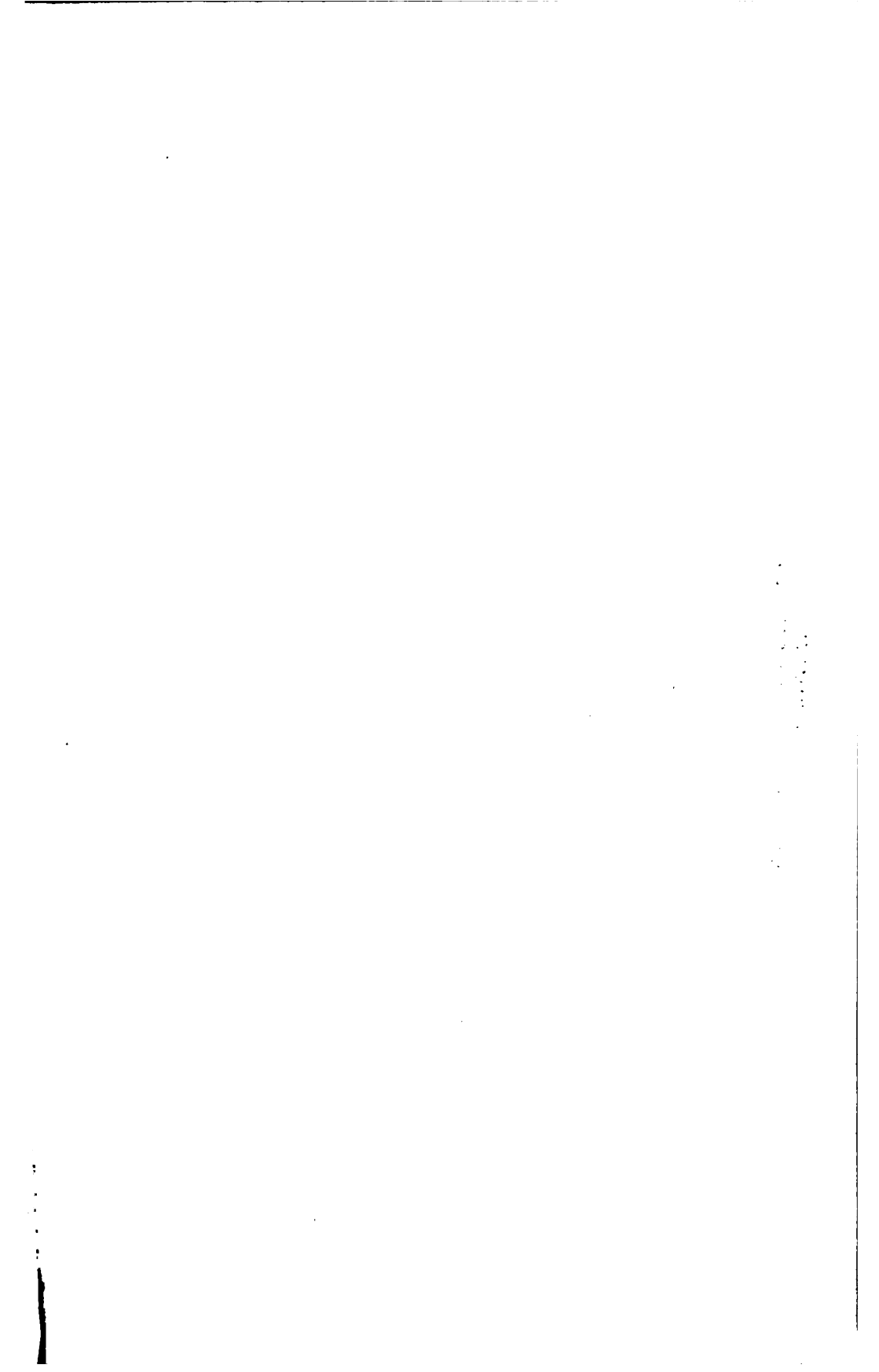
In the early stages, and especially in laryngeal diphtheria, steam inhalations by means of a croup kettle, the spout of which is introduced under a tent of blankets constructed over the child's crib, are indicated. The steam may be that from plain water, lime water, two and one-half percent. lactic acid solution, three percent. phenol solution, or one drachm (4.0) of eucalyptol to a pint (500.0) of water, etc.

In laryngeal diphtheria with obstruction and pronounced dyspnoea emetics should be given. Here syrup of ipecac may be administered in teaspoonful doses to a child of three years every fifteen to thirty minutes until emesis is induced, or a teaspoonful of the following formula may be given in the same way. *R. pulvis ipecacuanhæ, gr. ii, xxiiss (1.5); antimonii et potassii tartratis, gr. i (0.065); syrupi scillæ, ℥i (30.0); aquæ distillatæ, ℥iv (120.0).*

Laryngeal obstruction which does not yield quickly to this form of treatment necessitates immediate intubation or tracheotomy.

The internal administration of drugs with the hope of influencing the course of the disease is considered by many authorities quite useless while among the more conservative the old idea still prevails and drug medication is prescribed as before the introduction of antitoxin. Mercury bichloride is given to adults in doses of one forty-eighth to one-twelfth of a grain (0.0012 to 0.005) every two hours with potassium chlorate and tincture of iron chloride, in the hope of causing the membrane to loosen. For children the dosage should be somewhat lower. Toxic effects are not likely to occur since digestive disturbances usually appear before any harm is done. Calomel is also given with the same object in view, in fractional doses, one-sixth to one-eighth of a grain (0.010 to 0.008) every hour, until free diarrhoea is induced.

The saturated solution of potassium chlorate was for long the classical mouth wash in diphtheria and is still prescribed by some, but it is in no way



preferable to the solutions previously suggested. Gargling with potassium chlorate solution is inferior to irrigating and spraying, for it is almost impossible to bring the gargle into contact with the seat of the inflammation if it is behind the pillars of the fauces. Iron and quinine may be given through the course of the disease in the hope of supporting the patient's strength.

Stimulation becomes necessary as soon as the toxæmia is evidenced by the general condition and by tendency to heart weakness. In mild infections stimulants may be unnecessary, but most patients will require alcohol sooner or later. The need of its exhibition is shown by marked constitutional symptoms and feebleness of the pulse. The dosage should be regulated by the patient's condition and either brandy or whiskey, diluted with water, may be given. Half a drachm (2.0) every three hours is a proper amount for a child of five years. This quantity may be increased as necessary. Strychnine is valuable and digitalis may be given in small doses if there is low arterial tension combined with cardiac weakness. Sudden heart weakness necessitates the administration of stimulants hypodermatically, and here we may give camphor dissolved in ether or in sterile oil. Hypodermatic injections of morphine in appropriate doses are said to be our best means of combating the cardiac paralysis which is so much to be dreaded in diphtheria.

When there is evidence of obstruction to respiration, due to excessive formation of membrane in the larynx, intubation or tracheotomy becomes necessary. The former procedure possesses the following advantages: It is safe, rapid, and without danger, is free from shock, needs no anæsthesia, no wound is made, the patients make no objection, and the air taken into the lungs is warmed and filtered by its passage through the upper air passages. Intubation relieves the mechanical obstruction and the indication for its performance is dyspnœa which necessitates relief. Cyanosis is not a safe guide. When there is evident effort in respiration as shown by the action of the abdominal, thoracic and cervical muscles, weak heart action and coldness of the extremities, constitutional depression and evidence of marked toxæmia, intubation should be performed at once. It is far better to intubate too early than to wait until too late. In a few instances the laryngeal membrane may be pushed into the trachea by the introduction of the tube, but if the latter is withdrawn immediately the former will be coughed up; if this does not take place tracheotomy must be done at once. The operation of intubation is not difficult, and a moderate amount of practice upon the cadaver or upon dogs will render the physician proficient. O'Dwyer's original tube is best, but while he was accustomed to intubate with the patient in the erect position, the horizontal is preferable, especially if there is tendency to marked prostration or cardiac weakness.

Diphtheritic paralysis should be treated by rest in bed and, if persistent, by means of strychnine, electricity, massage and hydrotherapeutic measures.

During convalescence the patient should be kept in bed until all danger

of heart failure is past, this complication being prone to occur for some time after the acuity of the disease is over.

The diet should be fluid and it is very important that the patient should get sufficient nourishment. If nursing, the child should not be allowed the breast but should be fed upon milk withdrawn by means of the breast pump. For older children dilute cow's milk, if necessary peptonized, should be the chief food. If is often necessary, in order that the child shall receive plenty of food, especially in the later stages of the disease, when the appetite is insufficient and there is pain and difficulty in swallowing, to feed the patient by means of the stomach or nasal tube. The latter is especially to be employed in children who object to the former and in those who have been subjected to intubation or tracheotomy. The food should be predigested in so far as is possible. The operation is performed with the patient upon his back and the stomach should be washed before each feeding. Medicines may also be administered by means of the tube. Each feeding should be of considerable size for of necessity the operation cannot be performed at frequent intervals.

The quarantine should be continued until cultures from the throat show the presence of no diphtheria bacilli. The treatment of *diphtheroid infections* (pseudo-diphtheria) is the same as for true diphtheria, save that antitoxin is not indicated. Antistreptococcus serum may be given in its stead.

MUMPS.

Synonym. Epidemic Parotitis.

Definition. An acute infectious disease characterized by inflammation of one or both parotid glands, sometimes extending to the submaxillary, and rarely to the sublingual glands and occasionally to the testicles, ovaries and mammary glands.

Ætiology. This disease is most common in childhood and youth and is most likely to occur in the spring and fall. The infection is uncommon in young infants and in adults and attacks boys more frequently than girls. Sporadic instances of mumps are generally present in cities and epidemics occur at intervals. The disease is communicable from person to person but the specific cause of the contagion is not known; one attack usually confers immunity.

Pathology. The morbid anatomy of this disease consists of a congestion and œdema of the salivary glands with infiltrating swelling of the walls of their ducts resulting in obstruction of their lumen.

Symptoms. The incubation period is about two weeks. Prodromal symptoms are quite rare and in mild infections the initial symptoms are referable to the affected gland. In the severer types there may be such symptoms at the invasion of the infection as headache, general bodily pains, loss of appetite, vomiting and a rise of temperature, in mild instances rarely above

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101° F. (38.3° C.), but in the severe forms the fever may reach 103° to 104° F. (39.5° to 40° C.). The first local symptom is usually pain below and in front of the ear, pain in swallowing is often present and swelling soon becomes apparent in both parotid glands simultaneously or more often in one, the other becoming involved two or three days later or not at all. The swelling is in front of and below the ear and may affect the entire neck in this vicinity. The lobe of the ear is everted and occupies the central part of the tumor. The swelling reaches its greatest size in from two to three days and at this time the pain may be severe and the difficulty in swallowing marked, opening the mouth and mastication may be well-nigh impossible, the secretion of saliva is diminished, and there may be earache.

The disease is usually mild but in rare instances disturbing and even dangerous symptoms, such as delirium resulting from pressure upon the veins of the neck and consequent cerebral congestion, may occur. Suppuration of the glands is rare.

The fever lasts four or five days but the swelling may last a week or more. The opposite side may become involved after the original site of the disease has returned to normal.

Complications are rare in young children but in boys orchitis may occur after the inflammation of the parotids has subsided. The body of the testicle is affected rather than the epididymis and both organs may be involved. The onset of this complication is marked by a rise in temperature, the testicle is swollen, painful and tender, the acuity of the inflammation lasts several days but the swelling persists for a few weeks and rarely atrophy may result. Hydrocele of the tunica, oedema of the scrotum and a muco-purulent urethral discharge may accompany the orchitis.

Ovaritis, and inflammation of the vulva and of the mammary glands may occur in girls.

Still rarer complications are nephritis, otitis media and deafness, pneumonia, pericarditis, endocarditis, meningitis and facial paralysis. Enlargement of the thyroid gland and symptoms suggestive of pancreatic inflammation have been observed. Following the disease, permanent hypertrophy of the parotid may be noted.

Diagnosis. This is usually easy. Mumps is most likely to be mistaken for acute cervical lymphangitis but may be differentiated by the characteristic shape of the parotid tumor and by the elevation of the lobe of the ear.

Prognosis. This is very favorable, especially in the absence of complications.

Treatment. Isolation is necessary in institutions and in families where there are other children, and the quarantine should be continued for at least three weeks. At the onset of the disease the patient's bowels should be opened and if there is fever he should be put to bed and kept there until all constitutional symptoms have disappeared. Avoidance of exposure will

diminish the liability to complications. The pain in the swollen gland may be diminished by compresses of gauze impregnated with a five percent. solution of fluidextract of belladonna in glycerin, with a five percent. ointment of ichthyol or a two percent. solution of morphine in flexible collodion. The compress should be covered with rubber tissue or oiled-silk. Cold compresses may be grateful to the patient but the application of heat is usually preferred. Should the fever give rise to anxiety an ice coil may be applied to the precordium but this will seldom be found necessary. Other symptoms should be treated as they arise.

If enlargement and hardness of the parotid persists after the acuity of the infection has subsided, inunctions of six percent. iodine-vasogen or of a potassium iodide ointment are suggested.

The orchitis necessitates rest in bed, support of the testicles by means of a bridge across the thighs made of a strip of adhesive plaster and the application of a ten percent. ointment of ichthyol.

The dryness of the mouth should be relieved by washes of dilute liquor antisepticus.

The diet should be fluid while the temperature is elevated and even if this symptom is absent it may be impossible for the patient to take solids because of the pain upon mastication and deglutition.

WHOOPIING COUGH.

Synonym. Pertussis; Fussis Convulsiva.

Definition. A specific infectious and highly contagious disease characterized by catarrhal inflammation of the air passages and by paroxysms of coughing accompanied by long inspirations producing the typical "whoop."

Ætiology. This disease is endemic in cities and from time to time epidemics appear, especially in the winter and spring and often associated with epidemics of measles or scarlatina. Children are most frequently attacked and the most susceptible period is between the first and second dentitions. Nursing infants and adults may, however, contract the infection and in old persons it is likely to be serious. Delicate children and those prone to catarrhal affections are particularly liable to infection. Whooping cough is most contagious during the catarrhal stage and is generally spread by direct contact but schools, dwellings, etc., may be infected.

Various observers have described micro-organisms which they consider responsible for the occurrence of the disease but ~~their claims have not as yet been substantiated.~~

Immunity is usually conferred by one attack, and, while certain individuals seem unable to contract the affection, it must not be forgotten that the disease may occur in a mild form which may be overlooked.

Pathology. There is no constant morbid change associated with whoop-

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Hall's
observations on
ovoid bodies
secretion
whenever with
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Harvard Med Sch.
Laboratory

the bacillus
perfractus,
described by
Bordet
and
Gengou,
in 1906,

is generally
accepted as the cause.

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ing cough. Complications are usually responsible for fatalities and here we find the causative lesions such as broncho-pneumonia, bronchitis, collapse of the lung, vesicular and interstitial emphysema and enlargement of the tracheal and bronchial lymph nodes. After death during a paroxysm the brain is found in a state of congestion and punctate or larger hæmorrhages may be present.

Symptoms. After a period of incubation of from five to fourteen days days the first or catarrhal stage sets in. This is marked by slight rise in temperature, running at the nose, conjunctival injection, sore throat and cough, usually dry, and at times paroxysmal. The characteristic whoop may be present from the onset but more commonly after a week or ten days of atypical cough the tendency to the whoop becomes gradually more marked, the spasms are more and more frequent and the paroxysmal stage begins. A typical fit of coughing begins with fifteen to twenty short expiratory coughs between which there is no effort at inspiration. The face is flushed and perhaps cyanotic, the eyes are suffused and watery; there is a nasal discharge. At the termination of the paroxysm there is a deep inspiration accompanied by a whoop. Such a fit of coughing may be immediately succeeded by another, be terminated by the expectoration of more or less mucus or followed by emesis. The paroxysms vary in number from four or five daily to ten times this number. The patient recognizes the imminence of the coughing fits and endeavors to prevent them. Frequent vomiting may render the child emaciated as a result of its inability to retain sufficient nourishment. An ulcer due to friction against the lower incisors, may form at the frænum of the tongue; rupture of a nasal or conjunctival vessel and involuntary urination may occur during a paroxysm.

Physical examination of the thorax during the spasm reveals diminished pulmonary resonance during the expiratory coughs and normal resonance during the inspiration. During the whoop there may be absence of the normal vesicular murmur on account of the slowness with which air enters the lungs. Mucous râles may be present.

The attacks of coughing may be induced by emotion, irritating inhalations and even by deglutition. The paroxysmal stage of the disease lasts from one month to six weeks, increasing in intensity for the first half of this period, then remaining stationary for about a week and then gradually subsiding. The paroxysms are very likely to recur if the patient becomes chilled or if his digestion becomes disordered. This reappearance of the whoop is not to be considered a true relapse.

The stage of convalescence lasts from three to four weeks but may be much longer than this period.

Complications are frequent and sometimes serious. The congestion caused by the paroxysm may cause bleeding from the nose, conjunctiva or even the ears, as well as petechial hæmorrhages into the skin, hæmoptysis

and intestinal hæmorrhage. Intracranial extravasations of blood may occur, causing convulsions, various paralyses and even death. These hæmorrhages are, however, seldom large and their manifestations are rarely permanent. Disturbances of the special senses are sometimes noted.

Pulmonary complications are usually responsible when death takes place. Both broncho- and lobar pneumonia may be observed. Inflammation of the larger bronchi is the rule and is not especially to be feared; involvement of the small tubes is as serious as broncho-pneumonia. Transient vesicular emphysema is not uncommon, being caused by the severity of the paroxysm; interstitial and even subcutaneous emphysema have been observed. Enlargement of the bronchial glands is common.

Infants suffering from pertussis in summer are very frequently affected with diarrhœa. Malnutrition may result from the frequent emesis caused by the paroxysms.

Albuminuria and glycosuria may occur but these conditions are usually only temporary. Overstrain of the heart may result in permanent valvular endocarditis and, as sequelæ, hernia, especially umbilical, prolapsus ani and a predisposition to tuberculosis may be mentioned.

Diagnosis. In typical instances this may be easily made; others may occur, in which there is no whoop; here the problem is much more difficult, but a cough, occurring chiefly at night, which increases in severity for two or three weeks, is unaccompanied by constitutional symptoms and physical signs and which may manifest itself in paroxysms followed by vomiting, is probably pertussis. In the presence of epidemics the diagnosis is greatly simplified. An increase in the number of leukocytes, particularly of the lymphocytes, is an important feature of this disease.

Prognosis. This is distinctly bad in children under four years of age and in those previously delicate, broncho-pneumonia being responsible for many of the deaths.

Treatment. The patient should be kept from association with other children; confinement to a single room is unnecessary, consequently all individuals to whom the infection is prejudicial should be sent away. Particularly should all delicate children and those with any tuberculous tendency be kept from exposure. Quarantine is necessary until the paroxysmal stage is past.

In the treatment of the disease itself hygienic measures are most important.

The patient should, as a rule, be kept in the open air, especially during the warm months. Older children may be allowed out of doors on pleasant days even in winter. Delicate children, however, and those in whom there is any tendency to bronchitis should be kept in doors. Special stress should be laid upon the thorough and frequent ventilation of the apartments occupied by the patient since the frequency of the paroxysms is directly in proportion to the amount of carbon dioxide present in the air, and frequent,



~~Endothorax~~
is a new indication
for bronchial
or pulmonary
complications

even daily, fumigation by means of a formaldehyde candle or lamp. The patient must also be protected against dust. The bedding, clothing, etc., should be often changed.

In protracted instances a change of climate is indicated and delicate children do better, especially in winter, if they are taken to a warm place. The sea shore and sea voyages are often beneficial.

Internal Treatment. Of the almost numberless drugs, which have been recommended in whooping cough, bromoform is, perhaps, one of the most effectual but must be employed with great caution as instances of poisoning have been reported from its use. It may be administered in the following formula: Bromoform, $\frac{1}{2}$; alcohol, 8; glycerin, 48; compound tincture of cardamom, 8 parts. Each drachm (4.0) contains three minims (0.2) of bromoform which may be given to a child of two years, three or four times daily. The mixture should be carefully made and must be shaken immediately before taking. Bromoform may also be taken dropped upon lumps of sugar.

Antipyrine is a useful drug but should not be given if heart or severe pulmonary complications are present. Its dosage for a two-year-old child is two grains (0.12) five or six times a day. In cases with particularly marked paroxysms antipyrine may be advantageously combined with sodium bromide or heroine.

Quinine has enjoyed much vogue in the treatment of pertussis. Its dosage for a child of two years should be about three grains (0.2) three times a day; it may be given either as the sulphate or the hydrochloride. It is important that it should be prescribed in palatable form, for instance, in chocolate covered tablets. Its great disadvantage is its liability to disturb the stomach in infants and young children; this fault may be obviated by giving the drug in enemata or in suppositories. The treatment should begin early and it may be wise to give each dose directly after a fit of coughing since at this time it is less likely to cause gastric disturbance.

Aristochine (quinine carbonic ester) has no bitter taste and may be employed instead of quinine. Its dose is one and one-half to three grains (0.1 to 0.2) three times a day. Euquinine is another substitute for quinine.

In belladonna we have an effectual means of diminishing the number and severity of the paroxysms. The beginning dose should be small and gradually increased until physiological effects are produced. Its action must be carefully observed for the evidence of toxic symptoms. A two-year old child may receive of the fluidextract one-fourth to one-half a drop (0.015 to 0.03) every four hours; atropine in doses of one four-hundredth of a grain (0.00015) may be substituted. The above doses may be gradually increased in size or given at gradually diminished intervals until their physiological effect, as evidenced by dilatation of the pupils and by an erythema of the skin, is noted.

The emulsion of asafetida in dose of one-half a teaspoonful (2.0) every two hours is serviceable when the cough is well established and tenacious mucus is expelled.

Camphor is said to act, not only as a stimulant in the bronchitis and pneumonia of pertussis, but also upon the disease itself. It may be given internally in appropriate doses.

The severity of the nocturnal attacks may be lessened by sodium bromide two to four grains (0.12 to 0.25), or by codeine, or hydrated chloral; the latter, however, must be given with care. Certain clinicians rely chiefly upon camphorated tincture of opium (paregoric) to check the paroxysms.

In general it may be said of the drug treatment of whooping cough, that since the disease is self-limited and since in all probability its course cannot be shortened, internal medication, in patients whose paroxysms are neither distressing nor frequent, should be postponed until the cough becomes so marked as to interfere with rest and the bodily functions. When this event takes place medication is indicated.

Local treatment by means of sprays, inhalations, insufflations of various powders and by direct applications to the larynx may be prescribed. Sprays and insufflations probably influence the disease but little, but may be useful in allaying the catarrhal symptoms in the upper air passages. A mixture of equal parts of solution of hydrogen dioxide and glycerin, well diluted, sprayed into the naso-pharynx every four hours is satisfactory. As sprays a solution of one of the more soluble quinine salts, liquor antisepticus, or a mixture containing menthol 0.3, thymol iodide 1, oil of sweet almond 25 parts may be used. Insufflations such as the following may be employed: Benzoic acid and bismuth subsalicylate each 10, quinine sulphate 2 parts; or powdered antipyrine and quinine hydrochloride each 1, boric acid 2, bismuth subnitrate 5 parts. Direct applications of five percent. cocaine solution may be made to the larynx in older children, but with caution. One percent. solutions of phenol or of resorcinol are less dangerous. The applications of a one to two percent. solution of formalin to the pharynx has been advised. Inhalations, to be given by impregnating the air of the apartment with various mixtures or by means of an inhaler, are sometimes beneficial. By this means we may lessen the irritation of the air passages and combat the tendency to bronchitis. The following formulæ are applicable: Ether, chloroform, and creosote, equal parts; to be used upon the cotton or sponge respirator. Phenol 3, thymol 5, alcohol 50, compound tincture of lavender 20, water to 1000 parts; to be evaporated over an alcohol lamp. When phenol is employed the urine should be carefully observed and the remedy omitted at the first sign of darkening.

Inhalations of ethyl iodide are said to afford instant relief to the paroxysms and to lessen the severity of the disease.

The spasm of the glottis, which may occur when the attacks of coughing

are frequent and severe, may be relieved by means of laryngeal intubation. The tube may remain in place as long as the paroxysms continue.

For the convulsions a few whiffs of chloroform may be given.

A twenty percent. solution of cypress oil in alcohol sprinkled upon the patient's pillow, the upper part of the bed, and upon the underclothing several times daily is said to benefit the cough.

Paranephrine, which is the one-tenth of a one percent. solution of the hydrochloride of the active base of the suprarenal gland in dose for infants of two to four drops (0.12 to 0.25) to four times this quantity for older children has been highly recommended by Frederici. It should be given at frequent intervals during the catarrhal stages.

The tendency to vomiting may be lessened by applying an abdominal band to which a snugly fitting elastic bandage has been sewn. To young children, in whom this symptom is marked, a few drops of the camphorated tincture of opium or a half teaspoonful (2.0) of a mixture of dilute hydrochloric acid, one to one hundred parts of simple syrup may be given.

The sublingual ulcer should be kept clean by the use of mild antiseptic mouth washes and may be touched from time to time with a three percent. solution of silver nitrate. Heart weakness calls for the administration of alcohol and strychnine.

Throughout the disease the bowels should be kept freely open and the patient should be most carefully fed. The regulation of the diet is often a difficult matter since vomiting is so likely to occur, but is most important, for digestive disturbances accentuate the severity of the whooping cough and increase the frequency of the paroxysms. Young infants should be given diluted milk which may if necessary be peptonized. Older children should be allowed only fluids, chiefly milk, during the acuity of the disease. It is essential that the patient's nourishment be thoroughly maintained, consequently vomited meals should be repeated.

During convalescence the administration of tonics, especially codliver oil, the syrup of iron iodide and arsenic, is usually necessary since, even if the infection has run a seemingly uncomplicated course, the patient's system is depreciated and his powers of resistance are decreased, owing to the strain to which he has been subjected.

CEREBROSPINAL FEVER.

Synonyms. Epidemic Cerebrospinal Meningitis; Malignant Purpuric Fever; Petechial Fever; Spotted Fever.

Definition. An acute infectious febrile disease occurring sporadically and in epidemics and characterized by inflammation of the membranes of the brain and spinal cord and frequently by an eruption upon the skin.

Etiology. Epidemics of this disease have occurred from time to time

in the United States, the last being in New York City during the winter of 1904-5. The epidemics are usually localized and seem to occur rather more often in the country than in cities and usually in the winter and spring. Unsanitary conditions, fatigue, mental and physical depression and the association of large numbers of persons in small space, such as army camps and barracks, predispose to the occurrence of the disease.

The specific cause of epidemic meningitis is the *diplococcus intracellularis meningitidis*, described by Weichselbaum in 1887, which is found within the bodies of the polynuclear leukocytes of the inflammatory exudate. With this micro-organism other bacteria, such as the staphylococcus, the streptococcus, the pneumococcus, the bacillus coli, etc., may be associated.

Cerebrospinal fever is probably not directly contagious in that the infection is transmitted by fomites and the excretions, and it is difficult to trace the origin of a certain instance of the disease to any other, irregular distribution being a characteristic of the affection. The diplococcus is found in the mucus of the nose and adjacent respiratory organs and thus may infect healthy individuals. The contagium is, however, supposed to be air borne and to reach the meninges through the nose by way of the cribriform plate of the ethmoid bone.

Pathology. The skin may bear the remains of the petechial or herpetic eruption in certain instances, but the changes in the nervous system are more constant. These, however, are very variable in degree and may occur as merely slight congestion or as pronounced hyperæmia of the pia-arachnoid, with fibrino-purulent deposits, especially at the base of the cerebrum, resulting in a coating of the meninges with the exudate. The upper and lateral surfaces of the brain may also be involved in the inflammatory process. The exudate is beneath the pia mater and is likely to be more profuse in the longitudinal and Sylvian fissures. The substance of the brain may be congested and even softened. In the infections of long standing the meninges are thickened and adherent to the cortex. The ventricles are filled with seropus and, in prolonged instances of the disease, may be greatly distended, their walls being softened; here a condition of hydrocephalus may sometimes be met.

The cranial nerves, especially the optic, the facial, and the auditory, are often involved.

The spinal meninges are involved similarly to those of the brain. The exudate is most profuse upon their dorsal surfaces and the lower segments are chiefly affected. The spinal and the central canal may both contain pus in considerable amount. The cord itself may be inflamed and the spinal nerve roots may be the seat of a neuritis or may be compressed by the exudate.

Microscopical examination shows the exudate to consist of polynuclear leukocytes enmeshed in fibrin. The meningococcus is found both within the leukocytes and amongst the fibrin. The substance of the brain and cord

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may be infiltrated with pus, the neuroglia cells are swollen and hæmorrhagic foci may be present.

The lungs may be the seat of a pneumonia caused by the diplococcus pneumoniae or by the meningococcus. Pulmonary congestion or pleurisy may be observed.

Endocarditis sometimes is noted and the congestion of the various viscera occurring as a result of an infectious disease is usually present. The spleen may be enlarged.

Symptoms. These vary with the type of the disease. The incubation period of the *ordinary form* is not known. Its onset is usually sudden, although there may be a short prodromal period marked by dizziness, headache, and pain in the back. The invasion is often evidenced by a chill and vomiting of the projectile type followed by headache, pain in the back of the neck and in the lumbar region. These symptoms may be mild or very severe. The muscles of the neck are stiff, and movement causes an increase of the pain. The temperature is not characteristic, it may not exceed 102° F. (38.9° C.), but in marked infections it may reach 104° to 106° F. (40° to 41.1° C.) and may ascend even higher just before death. Remissions are not infrequent. The pulse in adults is at first not very rapid and is of good strength. Later it becomes faster and weaker. In children it is usually rapid from the outset. In certain instances the disease is characterized by a pulse of not over sixty or seventy. In the absence of pulmonary complications the respirations are not much accelerated. Sighing breathing and Cheyne-Stokes respiration are sometimes observed.

The symptoms due to the nervous system are marked and of early appearance. The skin is hyperæsthetic and the muscular rigidity increases as the disease progresses, spasm of the neck muscles draws the head back and opisthotonos may be present; clonic spasms may occur, especially in children, in whom the onset may be marked by a convulsion. Strabismus, nystagmus, and facial contractions are common. As the exudate increases, the symptoms of pressure paralysis succeed those of irritation and there are paralyses of the muscles of the face with ptosis, pupillary inequality and rarely paralysis of the muscles of the body and limbs. Of symptoms referable to the special senses photophobia, diplopia and auditory disturbances, especially intolerance of sound, are often present.

Delirium is an early symptom and may be violent. The increase in intracranial pressure later results in stupor and finally in coma.

The skin manifestations are important although the eruption is by no means constantly present. Herpes labialis is very frequent and herpetic eruptions may appear elsewhere upon the face as well as upon the body and limbs. The characteristic rash of the disease is petechial and often general. The number of spots varies greatly, in some instances only a few being noted, while in others they are very numerous. They do not disappear on

pressure. Other rashes such as erythema, urticaria, ecthyma, erythema nodosum, pemphigus and spots resembling those of enteric fever, may occur. Cutaneous gangrene has been noted.

The tongue is at first moist and coated, later it may become dry; distressing vomiting may persist throughout the disease. The bowels are usually constipated but at times a diarrhoea may be present at the invasion.

The urine is usually scanty, high colored and contains albumin. At times it is increased in quantity and contains glucose as a result of the pressure of the exudate upon the cerebral centers.

Leukocytosis is a constant, and often persistent symptom.

Kernig's sign is constantly present here as in all other conditions in which there is inflammation of the spinal meninges. It is obtained by placing the patient in a sitting position with the thighs flexed at the hips and the legs partly flexed at the knees. The observer then attempts to extend the leg at the knee; this will be found impossible on account of the resistance of the flexor muscles. If the thigh is not flexed upon the abdomen the leg can be straightened. This phenomenon is explained upon the ground that in meningeal inflammation the spinal nerve roots become irritable and the flexion of the thighs at the hips, when the patient is sitting, tends to stretch the lumbar and sacral roots and increase their irritability.

Babinski's reflex, a turning up of the toes, especially the great toe, consequent upon tickling the sole, is not constant and inasmuch as it occurs in hemiplegia and other results of lesions of the motor tract, it is not of much diagnostic importance in this connection.

The course of cerebrospinal fever is very variable; death may occur within a few hours or the disease may be prolonged for months. In fatal instances death usually occurs within the first week. If the patient survives for five or more days improvement may be expected, the temperature falls, the nervous symptoms gradually clear and convalescence becomes established. This period is usually long. Relapses are not common.

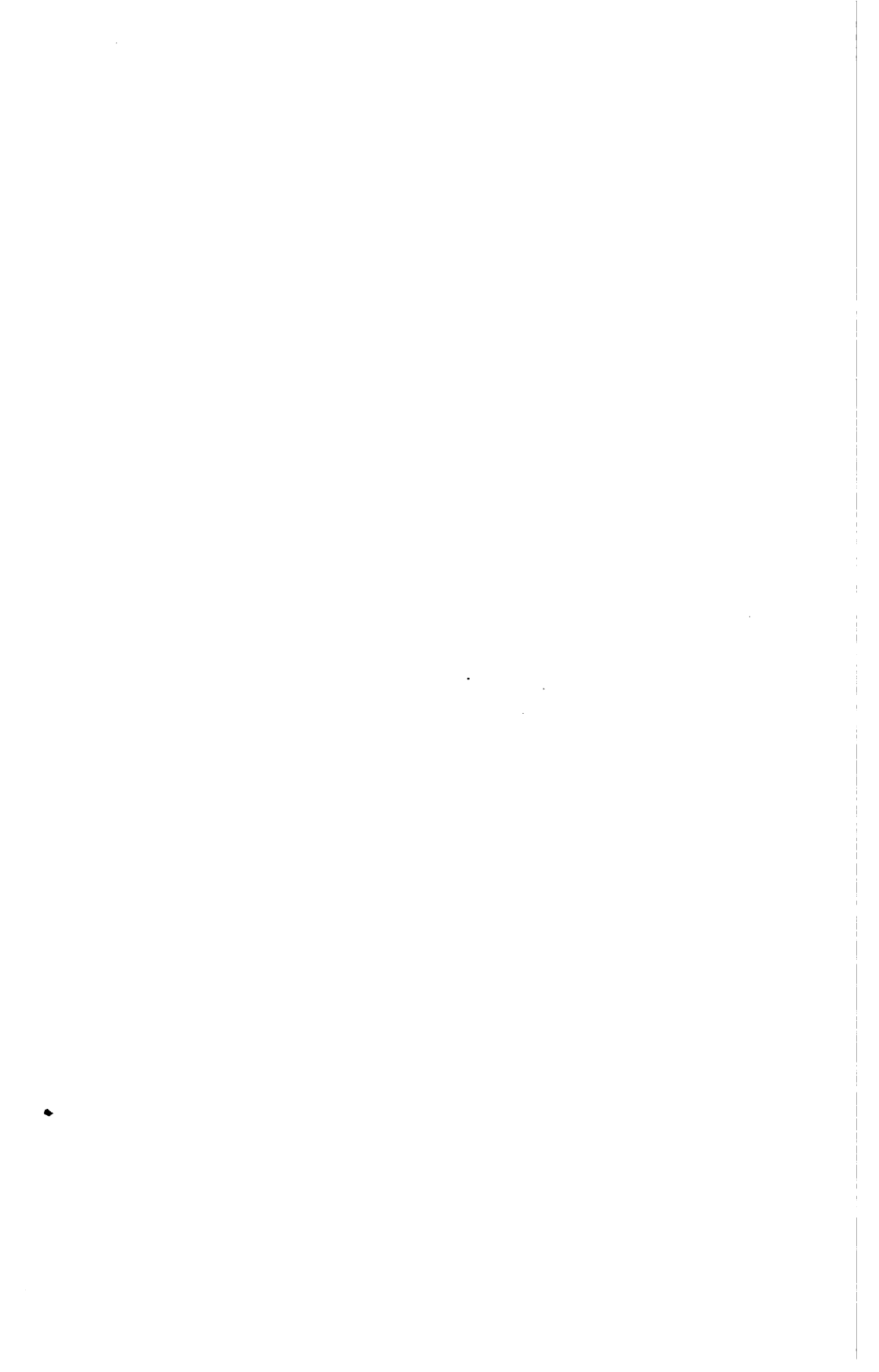
The malignant form of the disease is very sudden in its invasion and while there may be only slight rise in temperature the headache and nervous symptoms are pronounced, collapse with feeble and slow pulse and labored respiration ensues, to be followed by death, sometimes within twenty-four hours. A hæmorrhagic eruption is usually present. Such infections are often seen at the beginning of an epidemic.

A mild form of the disease sometimes occurs in which the presence of an epidemic gives the only clue to diagnosis.

The abortive form is evidenced by pronounced and severe symptoms at its onset; these cease suddenly and an early convalescence is established.

The intermittent form is characterized by a temperature resembling that of pyæmia and which exhibits remissions daily or every other day.

The chronic form. This designation is applied to a type of the disease



in which the course may be prolonged for several months. The patient suffers from headache, digestive irritability, marked emaciation and exhaustion, and remissions of the fever.

Complications. Of these pneumonia is one of the most frequent and it may be difficult to determine whether it or the meningeal inflammation is the primary disease. In these cases, while the results of laboratory investigation prove the disease to be cerebrospinal fever, the marked physical signs and serious symptoms may be almost entirely pulmonary. In the presence of an epidemic the problem is more simple than at other times, and when the headache, pain and stiffness in the back, and nervous symptoms precede other manifestations, the chances are in favor of meningitis. Pleurisy, bronchitis, endocarditis and parotid inflammation may occur. Arthritis is a common complication in certain epidemics. The affection is usually multiple and the effusion may be either serous or purulent.

The sequelæ of cerebrospinal fever are numerous and often serious. Those referable to the motor nervous system are facial palsy of varying extent and paralyses of the limbs; these may be permanent but are usually temporary only. Sequelæ referable to the organs of special sense are optic neuritis resulting in blindness, choroido-iritis and keratitis; labyrinthine inflammation resulting in deafness, otitis media and its complications. Speech disturbances may occur and obstinate headache and muscular pains have been noted. Chronic hydrocephalus, abscess of the brain and mental weakness have been observed.

Diagnosis. During epidemics this is usually not difficult but the recognition of sporadic instances, especially those of atypical course, is sometimes far from easy. The diagnostic symptoms which are present early in the disease are the headache, stiffness, with retraction of the head, of the muscles of the neck and back, tremors and mental disturbance, especially delirium. Pneumonia may be mistaken for meningitis but here we have a diminution of the urinary chlorides, an absence of Kernig's sign, a rapid pulse and a preponderance of the pulmonary symptoms over those referable to the nervous system. Inasmuch as epidemics of cerebrospinal and typhus fevers sometimes prevail simultaneously care should be taken. Rheumatism, either articular or what is commonly called muscular, is often suggested but readily excluded. Typhoid fever, particularly if meningeal symptoms are present, may give rise to doubt for a time but only for a few days. Influenza often must be considered if no epidemic of cerebrospinal fever is known to exist. For that reason lumbar puncture should be adopted as a part of routine investigation. With regard to the general differentiation of this disease, the presence of Kernig's sign is an important point and the result of lumbar puncture should confirm or disprove the diagnosis. This operation is simple, harmless and needs no anæsthesia beyond that obtainable by means of the ethyl chloride or ether spray, or at most a few breaths of chloroform. The

patient should lie upon the right side with knees drawn up and the left shoulder turned toward the front. An aspirating syringe is used, the needle of which is introduced one-fifth of an inch (one-half centimeter) to one side of the median line and midway between the third and fourth or the fourth and fifth lumbar vertebræ below the spinous process, the thumb being placed as a guide between the spinous processes. The needle should be directed slightly upward and inward, and at a depth of about two-fifths of an inch (one centimeter) in infants and from two to three times this distance in adults, should enter the canal. The syringe now being detached from the needle the fluid is allowed to flow into a sterile test tube. From one and one-half to four drachms (6.0 to 16.0) are necessary for chemical, microscopical and bacteriological examination. The fluid in epidemic meningitis is usually turbid and may contain pus or blood; that in tuberculous meningitis is clear in most instances. The meningococcus is often present in the fluid of epidemic meningitis in considerable numbers.

Macewen's sign, if obtained, is an indication that fluid is present in the ventricle. The patient should be placed in the upright position with the head inclined to one side. On percussing over the frontal or parietal bone a tympanitic sound is heard. However fluid may be present without this sign being elicited.

Prognosis. This varies in different epidemics from twenty to seventy-five percent. The mortality is very high in the prolonged cases, in young children and in the aged. The initial symptoms give no index of the probable subsequent course of the disease, and while a mild invasion may be followed by grave symptoms, a severe onset may be succeeded by a rapid amelioration. Convalescence may be interrupted by recrudescences or relapses.

Treatment. Much in the way of prevention may be accomplished by the establishment of proper ventilation, drainage and general sanitation.

In private practice the patient should be isolated, in order to secure the necessary quiet as well as to prevent contagion, in a properly ventilated room which need not be darkened since bandaging the eyes accomplishes the same purpose.

The old method of treatment by blood-letting is seldom employed at present but the pain may be relieved in robust patients by the application of wet cups to the back of the neck; the use of the ice cap and of ice bags applied along the course of the spinal cord is to be recommended, and while blistering is unnecessary, touching the skin of the nape of the neck with the actual cautery may be beneficial. Elevating the head of the bed often makes the patient more comfortable.

The plan of treatment by means of hot bathing as advocated by Aufrecht is said to accomplish exceedingly good results. A hot bath at 104° F. (40° C.) lasting from fifteen to twenty minutes is given once or twice daily or even oftener. An ice bag is applied to the head and stimulants, such as alcohol,

ammonia, etc., are given as indicated. While the temperature, muscular rigidity and emesis are not markedly influenced by this treatment, it is asserted that bathing after this method relieves the pain, lessens the restlessness and delirium and may restore consciousness. Such complications as endocarditis do not necessitate the intermission of this treatment. It may be safely stated with regard to the hot bath method, that it does no harm, may benefit the patient and may exert a favorable influence upon the course of the infection.

Lumbar puncture, with or without the injection of antiseptic fluids, has been employed in treatment as well as in diagnosis, by many clinicians. The opinions as to its efficacy differ to a marked degree. It may be asserted, however, that, even though the procedure may not be curative, it does relieve the symptoms due to pressure and is worthy of employment for this reason. In instances where marked pressure symptoms are present from five to fifteen drachms (20.0 to 60.0) may be withdrawn and the procedure repeated if necessary. Where only slight evidence of pressure is manifest not more than five to eight drachms (20.0 to 30.0) should be withdrawn.

The hot bath treatment and that by lumbar puncture may be employed in connection with one another.

Of more importance than the hot bath is the use of Flexner's serum which is used after lumbar puncture. An amount of cerebro-spinal fluid, at least equal to, and preferably one-half larger than the proposed dose of serum, is withdrawn; then the serum is injected directly into the subarachnoid space, and repeated daily for three or four days for in this way the percentage of cures is increased, the convalescence is shortened and the tendency to recurrences and complications is lessened. The usual dosage is one ounce (30.0). About seventy-five percent. of patients recover under this treatment. In about twenty-five percent. of instances of this disease it terminates by crisis.

Of the solutions for intraspinal injection, following the withdrawal of fluid by lumbar puncture, one percent. lysol is most commonly used. From two to three drachms (8.0 to 12.0) have been injected with varying results in the hands of different clinicians. Mercury oxycyanide solution has also been employed. This form of treatment, while it may do no harm; has, taking everything into consideration, given no very remarkable results. Undoubtedly of more importance as antiseptic treatment is the use of soluble silver thirty to seventy-five grains (2.0 to 5.0) in three ounces (90.0) of warm, previously boiled water, twice daily *per rectum*, the bowels having been prepared for this treatment by thorough cleaning with injections of normal saline solution.

The fact that there is a marked antagonism between the meningococcus and the Klebs-Löffler bacillus has suggested the employment of diphtheria antitoxin in the treatment of meningitis but unfortunately the results obtained

either by hypodermatic or intraspinal injections of antidiphtheritic serum have not been sufficiently good to establish this treatment upon a firm basis.

The subcutaneous injection of mercury bichloride solution along the course of the spinal cord has been recommended by several authors. The adult dose is one-sixth of a grain (0.01) and that for children from one one hundred and twentieth to one-twelfth of a grain (0.0005 to 0.005). The injections are well borne and may be repeated while the temperature, pain and muscular stiffness persist. Angyan, who has reported at length upon this form of treatment, while not asserting that it influences the duration of the disease, considers that by its use the symptoms are favorably affected.

With regard to the general management of epidemic cerebrospinal meningitis and the relief of symptoms the following points may be given. The bowels should be kept freely open throughout the disease by means of calomel given in divided doses, by salines or by enemata. The patient should be allowed plenty of water to drink which will increase the elimination of the toxin through the kidneys. In instances of urinary retention the use of the catheter may become necessary.

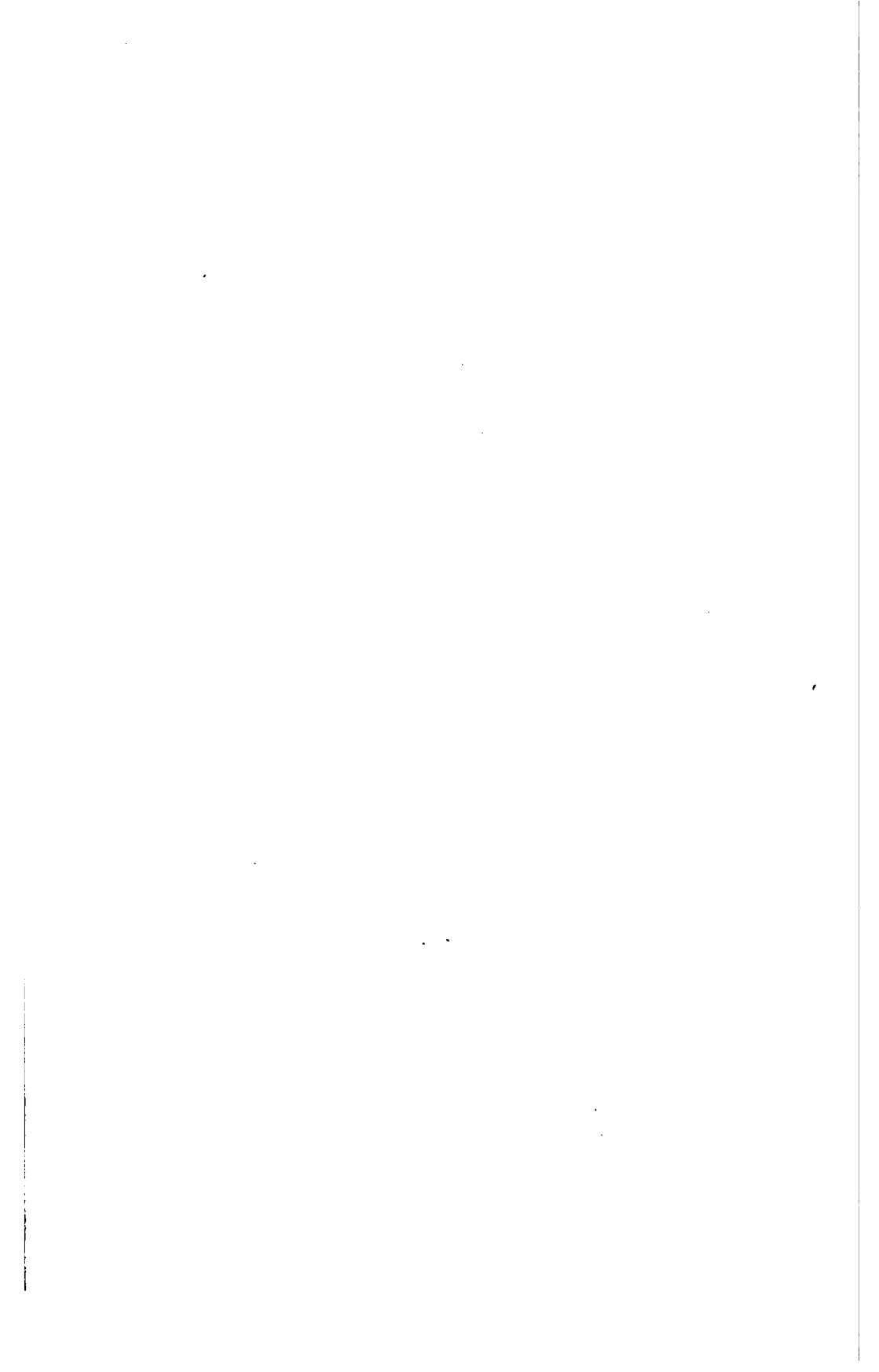
The nose and throat, which are often inflamed, should be sprayed and irrigated with mild alkaline solutions and the frequent use of a mouth wash will lessen the tendency to dryness of the tongue. In instances where there is dysphagia, feeding by means of the stomach or nasal tube or by the rectum should be practised.

For the vomiting the patient should be given bits of cracked ice to suck, cold should be applied to the epigastrium and feeding should be infrequent until this symptom is under control. In obstinate infections the use of morphine hypodermatically may become imperative. Vomiting due to pressure upon the medulla may be relieved by lumbar puncture.

The nervous symptoms necessitate the employment of various analgesics and sedatives. Tepid baths, to which mustard may be added, often, in the milder infections lessen the tendency to sensory, motor and mental excitability and may induce sleep. Antipyrine is often effectual in checking the headache and general hyperæsthesia and is also useful in lowering the temperature, and relieving the mental excitability. While not likely to cause cardiac depression, the drug should be given with care. Acetphenetidin may also be employed. When these two drugs fail to control the nervous symptoms we may have recourse to codeine or morphine. The bromides likewise may be administered in this connection. For the convulsions hydrated chloral should be given *per rectum* and inhalations of chloroform may be prescribed. Where these fail hypodermatic injections of morphine should be given; in children great care should be exercised.

In the later stages, where cardiac weakness is pronounced, free stimulation by means of alcohol, ammonia and, in cases of collapse, by hypodermatic injections of camphor in oil, are indicated. Heart weakness may also

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be combated by means of high hot saline irrigations given *per rectum* and by hypodermatoclysis with normal saline solution. The former procedure has the additional advantage of assisting in the elimination of toxins through the kidneys, in being a vigorous diuretic.

Various drugs have enjoyed, probably undeservedly, a vogue in the treatment of this disease. Among them may be mentioned ergot, quinine, physostigma and belladonna.

In chronic types of the disease and in those which are left with meningeal thickenings potassium iodide or the syrup of hydriodic acid should be given with the intent to induce absorption.

The complications and sequelæ should be treated as when occurring as a result of other causes.

The importance of maintaining nutrition cannot be overrated. During the acute stage the diet should consist of milk, broths, gruels, and other fluids; later semi-solids, to be followed by ordinary diet, may be allowed.

During convalescence an abundance of fresh air, sunshine, and an abundance of easily absorbable food is necessary. Electricity skilfully applied and massage are important methods for hastening cure.

POSTERIOR BASAL MENINGITIS.

During epidemics of cerebrospinal fever children under two years of age present symptoms which are due to the susceptibility of the cerebral structures, possibly to their conformation but of which the exciting cause is the same micro-organism.

Pathology. The inflammation is generally limited to the posterior portion of the base of the brain at its onset. Later it travels down the cord, upward into the ventricles, and forward along the base. Suppuration may occur easily. Even after absorption an adhesive meningitis is likely to result which may give rise to hydrocephalus.

Symptoms. The most marked is the constant one of retraction of the head. The attack is sudden, fever is present, repeated vomiting is often followed by convulsions. Later comes muscular rigidity and especially stiffness of the neck. Soon the abdomen is retracted, the upper limbs especially and sometimes the lower limbs adducted, the hands strongly flexed on the forearm, the feet extended, and the toes are flexed on the soles. Later these spastic appearances may diminish. There is generally a leukocytosis. If the canal of Magendie is not closed by adhesions the fluid obtained by lumbar puncture may contain the *diplococcus intracellularis*.

Prognosis. This form of cerebrospinal fever seems to pursue a chronic course and to be particularly fatal.

Treatment. It has been proposed to trephine the skull and by incision and drainage, connect the ventricular and subarachnoid spaces. This having been done, the treatment is the same as for cerebrospinal fever.

ERYSIPELAS.

Synonym. St. Anthony's Fire.

Definition. An acute, febrile, contagious disease characterized by intense local inflammation of the skin, a remittent temperature, and a tendency to spread.

Ætiology. This disease is common, often endemic and from time to time epidemic. It is most frequent in the spring months and is very likely to break out in old and improperly kept hospitals and institutions; it may occur, however, under the best sanitary conditions. Poor general condition, alcoholism, and chronic diseases predispose to its incidence and certain individuals seem especially prone to acquire the infection. One attack does not confer immunity, on the contrary recurrences are frequent. Women, *post-partum*, and the subjects of recent surgical operations, even such procedures as cupping, leeching and vaccination, are particularly liable to acquire the disease.

The contagium, while not very active, may be transmitted by contact with a third person and by fomites, bedding, furniture, etc. While a solution of the continuity of the skin would seem to be a necessary antecedent to infection, idiopathic cases do occur in which no such manifestation is discoverable; in such, however, it is impossible to state that a microscopical lesion has not existed, although the possibility that the contagium may reach the blood stream by means of the respiratory or the digestive tracts must be considered.

The specific cause of erysipelas is a bacterium, one of the micro-organisms of the *streptococcus pyogenes* group, the *streptococcus erysipelatis* of Fehleisen who isolated the *erysipelococcus* in 1881.

Pathology. The inflammatory redness of the skin in erysipelas does not persist *post mortem*, but œdema and abscesses or blebs, if they have occurred, are left behind. Microscopic examination reveals the presence of the streptococci in the lymphatics and lymph spaces at the margin of the inflamed area; they may be demonstrated in the lymph vessels of the structures beyond the affected tissues as well. Associated lesions are metastatic abscesses in the various organs and hæmorrhagic infarcts of the lungs, kidneys, or spleen. Secondary septic pleurisy, pericarditis, or endocarditis may be present. Acute nephritis may be found; meningitis and pneumonia are rare.

Symptoms. The variety of erysipelas which usually confronts the physician is that which occurs without previous discoverable lesion and most often involves the head and face. The incubation period is given by various authorities as being from one day to two weeks. The onset of the disease is usually marked by one or more chills, malaise, and anorexia, followed by a rise of temperature. If the point at which infection has taken place is discoverable it becomes red, a reddened, burning spot appearing usually upon

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the bridge of the nose or upon the chin. This rapidly increases in size, becoming elevated with a distinctly palpable margin, smooth, brawny, œdematous and hot to the touch. The skin feels tense to the patient and the inflammation spreads rapidly toward the forehead and ears, closing the eyes, thickening the lips and ears, and distorting the features. Blebs form upon the ears and eyelids containing serum; the neck is rarely involved, but the cervical glands are swollen and there is marked leukocytosis. In the severe types deep abscesses may form. The inflammation, as it extends, gradually diminishes in the parts first affected, lasting about four days in one area. If its progress becomes limited the temperature falls by crisis and the symptoms disappear. Recurrences are not rare. During the fever the pulse is rapid, there are headache and sometimes cerebral symptoms, the constitutional manifestations being due to the toxæmia resulting from the growth of the bacteria in the organism.

Severe infections, which are not uncommonly met in aged, debilitated, and alcoholic patients, are characterized by marked prostration, cerebral symptoms, and the appearance of the so-called "typhoid state" in which death may occur.

The mucous membranes of the mouth, pharynx, and larynx may be involved by extension from the skin, and laryngeal œdema may ensue. Albuminuria is common and hæmaturia has been observed.

Protracted infections may be met in which the inflammation wanders from one part to another, gradually involving the whole body.

Complications are not common, although such conditions as septic inflammations of the pleura, pericardium and endocardium, bronchitis, pneumonia, and nephritis may be encountered.

Meningitis is very rare, although delirium is not unusual; septicæmia and pyæmia are more often seen.

Diagnosis. This is usually easy, the constitutional and local manifestations being quite characteristic.

Prognosis. In robust persons this is good, but the debilitated, those addicted to alcohol, infants with erysipelas due to infection at the umbilicus, and the aged furnish the great majority of the fatalities.

Treatment. With regard to prophylaxis it may be stated that isolation is a necessity, especially in hospitals. Surgeons and those engaged in obstetrical practice should not attend patients with erysipelas. Frequent baths with boric acid solution (five per cent.) will remove the desquamating epidermis, and the bed and body linen should be changed at least once daily.

The patient should be kept in bed upon a liquid diet and the channels of elimination should be kept freely open by means of plenty of fluids to drink and laxatives when necessary. If there is headache and severe general pain such analgesics as antipyrine salicylate, ten grains (0.65) or acetphenetidine,

ten grains (0.65) may be prescribed. The cerebral symptoms, if present, may be controlled by cool or tepid sponge baths, by the bromides, or by morphine hypodermatically. In feeble patients stimulation by means of alcohol and strychnine may be employed as indicated.

It is doubtful if internal medication can influence the infection in any way, but the tincture of iron chloride is prescribed by many in hope that in some way it may exert a specific action. A drachm (4.0) every three hours may be given but a smaller dose—ten drops (0.65)—will probably be quite as efficacious.

Injections of antiseptic solutions into the skin just beyond the margin of the inflammatory area have been practised and seem to have a rational basis for their employment. Two percent. phenol solution or one to four thousand mercury bichloride solution may be used.

Of local applications by far the most effectual is an inunction of Credé's ointment of soluble silver twice daily. This limits the area of extension and promptly ameliorates the symptoms. Or several layers of gauze extending beyond the affected area may be kept constantly wet with a saturated aqueous solution of magnesium sulphate and covered with oiled silk. At present an ointment or solution of ichthyol of ten per cent. strength, applied upon gauze and renewed several times daily, is in considerable favor. An ointment containing one part of phenol, ten parts of ichthyol and twenty parts of lanolin is also recommended. Moist dressings of one percent. phenol, one to one thousand mercury bichloride, equal parts of ichthyol, glycerin, and water, one to one thousand potassium permanganate, and dusting with equal parts of bismuth benzoate and starch have been suggested.

In the umbilical infection of the new-born, ichthyol in ten percent. solution or ointment or an ointment of one part of mercury bichloride, two hundred parts of cerate of lead subacetate, and eight hundred parts of vaseline may be applied.

The suggestion to lightly scarify the part before applying moist antiseptic dressing would seem reasonable since by this means the germicide is able to come into closer contact with the infective micro-organisms in the tissues.

Various observers have employed injections of antistreptococcus serum; the results reported have in many instances been favorable and it is quite possible that further experimentation with this treatment may establish it as a routine method. This form of treatment does not seem to shorten the disease, but the injection of five drachms (20.0) of the serum in one or two doses is said to lessen the severity of the symptoms and to cause a disappearance of the albuminuria.

The diet during the febrile stage should be of fluids only and as highly nutritious as possible in order to maintain the patient's strength and powers of resistance.

During convalescence the dietary should still be carefully regulated, and the administration of tonics, such as strychnine, iron and quinine is strongly indicated.

ACUTE ARTICULAR RHEUMATISM.

Synonyms. Rheumatic Fever; Inflammatory Rheumatism; Acute Rheumatism.

Definition. An acute febrile infectious disease characterized by inflammation of one or more of the joints.

Etiology. The disease is most common during the cold and damp months and in young adults, especially those of low vitality and whose occupations expose them to the inclemencies of weather. Extremes of cold are less likely to predispose to the disease than a moderately low temperature accompanied by moisture. An hereditary tendency to the disease has been noted.

It is probable that the infection is the result of specific bacterial intoxication, although thus far no causative germ has been isolated. Various observers have, however, cultivated from the inflammatory exudates of rheumatic joints different micro-organisms which are capable of causing arthritis and endocarditis in lower animals. Several distinct species of bacteria have been isolated from rheumatic exudates which fact goes to show, as suggested by Flexner and Barker, that perhaps acute articular rheumatism may be the result of infection of the blood by any one of several species of pathogenic micro-organisms at a time when circumstances are such as not to favor the development of general septicæmia but are favorable to the propagation of inflammatory conditions of one or more of the serous membranes.

Various forms of arthritis simulate acute articular rheumatism, such as those complicating other acute infectious diseases, notably scarlatina, and the arthritis due to the gonococcus. These are not true rheumatisms but inflammations of the synovial membranes due to other causes.

Pathology. The affected joint is swollen, hot, sometimes red, and is bathed in acid perspiration. Its synovial lining is congested and swollen. The joint cavity is sometimes distended by fluid. This is usually serous but may be turbid, or rarely purulent. The cartilages within the joint and covering the articular surfaces may be eroded.

Symptoms. The onset of the disease is usually rapid, one or more joints becoming, even within a few hours, swollen, painful, tender, reddened and bathed in perspiration. Less frequently there is a short period of invasion during which the patient may suffer from a sore throat and has indefinite pains in bones and joints. The onset is rarely marked by a chill, but is usually followed by a rise in temperature. The regular course of the infection lasts about six weeks but with proper treatment we are usually able to

shorten the acute stage to six or seven days. With the inception of the disease there is often nausea and vomiting. The temperature rises to 102° to 104° F. (38.9° to 40° C.). The pulse is accelerated (ninety to one hundred), the urine is scanty, high colored and acid with a copious sediment of urates; it may contain albumin; the bowels are usually constipated. The febrile movement continues while the joints are acutely inflamed but frequently is of remittent type.

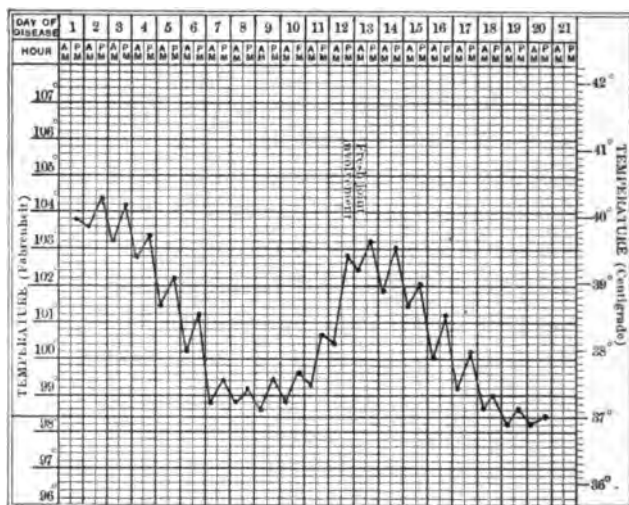


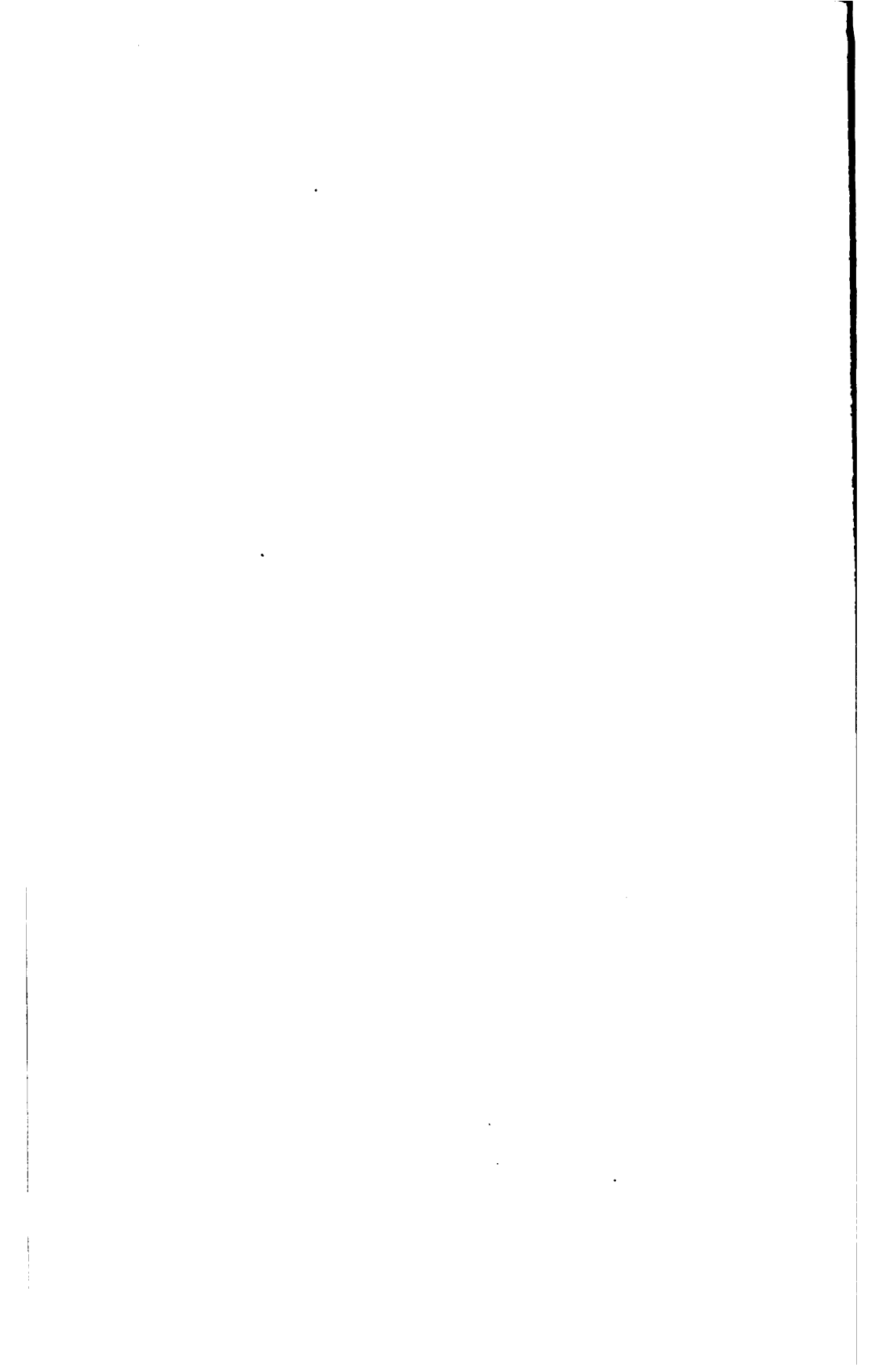
FIG. 6.—Clinical chart of acute articular rheumatism.

The skin is usually bathed in an acid perspiration and it may be the seat of various eruptions. These may be erythemata, diffuse papular, tubercular or marginate urticaria, or a true purpura with hæmorrhagic spots of varying size. Sloughing may follow these last and with them there may be hæmorrhages from the various mucous membranes and hæmaturia. This condition is denominated *peliosis rheumatica* and is of doubtful rheumatic origin. Nodules of various sizes up to that of a pea have been observed in certain patients in the tendons and muscle sheaths of the extremities, limbs and even over the vertebræ. These are a feature of the declining stage of the disease; they are more usually seen in children and remain from several days to several weeks.

The pain is usually very severe, any movement increases it and even the weight of the bed clothing may cause extreme discomfort. The patient finds that the pain is least when the joints are held in a position of mid-flexion.

Usually more than one joint is inflamed and those most often attacked are the knee, ankle, wrist, elbow, shoulder and hip, in the order named. The joints of the fingers are not exempt. Rarely is a single joint affected, though this may occur. The inflammation has a tendency to involve successively one joint after another, the symptoms in one being to some extent relieved as





another is attacked. At times the process will recur in a joint which has partially returned to normal.

A patient who has once suffered from rheumatic fever is prone to recurrences of the disease at intervals of from one to several years, and it is these successive attacks which are likely to result in serious complications, more especially in the heart.

Hyperpyrexia. In certain patients the temperature may rise to a very high level even to 110° F. (43.3° C.). Such a condition is a very serious one and generally results in death unless the fever can be quickly reduced. With this excessive temperature are other symptoms of marked constitutional disturbance, such as headache, delirium, even mania, unconsciousness and heart failure.

Complications. These affect the serous membranes and the endocardium and are the result of the lodgment of the infectious material in the blood in these situations. The pleura, the pericardium and more rarely the peritonæum are the membranes involved and their inflammations are amenable to antirheumatic treatment. In rheumatic pleurisy physical signs are conspicuously absent, an important point in differential diagnosis.

Endocarditis is a frequent and most dreaded complication, its usual seat is in the left side of the heart and it is less likely to attack the aortic than the mitral valve. The heart should be the subject of very frequent examination since in even mild rheumatic infections it may become the seat of valvular disease of severe type. The proportion of heart complications in this disease is stated by some authorities to be as high as sixty percent. The onset may be gradual and difficult of diagnosis, while dyspnoea and palpitation may appear as features of a rheumatic attack with merely a functional cardiac disorder. The endocarditis is more frequently seen in youthful patients and is usually of the vegetative type. The heart may regain its normal condition but most of the instances of chronic endocarditis seen in practice are the result of rheumatic infection.

Infective or malignant endocarditis may occur, but inflammations of the myocardium are believed to be rare.

In consideration of the sequelæ of acute rheumatism, chorea, exophthalmic goitre and acute nephritis, and the permanent joint changes similar to those of chronic articular rheumatism and arthritis deformans, should be mentioned.

Prognosis. Recovery is usual in non-complicated cases. The duration of the acute stage of the disease when untreated is about sixteen days but with proper treatment this may be much shortened. In many instances the infection leaves the patient with a permanently impaired heart. Rarely the patient passes on to the condition known as chronic rheumatism.

Death, when it takes place, is usually the result of hyperpyrexia or cardiac complications.

Prophylaxis. Persons subject to the disease should avoid excessive

muscular exertion and especially exposure to cold and wet. Their clothing should be warm, preferably of wool next to the skin in winter and of linen during the hot months. Too much carbohydrate food and malt and other alcoholic beverages should be avoided, and the liver and bowels should be kept active. Daily baths, cold, preferably, if well borne, should be taken in order to keep the skin active and healthy. Out-door life and proper exercise are important.

Treatment. The patient should be kept in bed, upon a soft mattress and covered with blankets, not sheets. Calomel followed by a saline should be administered and the bowels should be kept freely open during the whole course of the disease.

Medicinal Treatment. The salicylates are an exact chemical limitant of the action of the causative bacteria, but the problem is to administer these in sufficient dosage to accomplish our object without injury to the heart, stomach or kidneys. Salicylic acid and sodium salicylate, especially the former, are very likely to disturb the stomach, and, being eliminated through the kidneys, these organs are likely to receive harm. The acid in large doses diminishes the contractile power of involuntary muscle fibre and consequently its administration may result in acute cardiac dilatation. The ideal drug would be an organic combination of the salicyl radical which would pass through the stomach unchanged to be split up in the intestines. Sixty to eighty grains (4.0 to 5.30) per day of the salicyl radical are necessary to cause a disappearance of the symptoms within a week and so great a quantity is likely to be harmful, and certainly is objectionable, to the patient. The problem being to bring the salicylate into direct contact with the joint in as great a quantity as possible and to prevent its getting into the circulation, the following ointment is prescribed: \mathcal{R} acidi salicylici, olei terebinthinæ, adipis lanæ hydrosi, $\mathfrak{a}\mathfrak{a}$ \mathfrak{Z} j (4.0), unguenti, q. s. ad \mathfrak{Z} j (30.0). *Signa.* Rub one drachm (4.0) thoroughly into the diseased joint twice a day. The fact that a curative quantity of the salicyl radical is absorbed may be proven by finding salicyluric acid, in which form salicylic acid is excreted in the urine within twenty minutes after an inunction, as shown by the port wine color which appears in the test tube of urine to which ten drops (0.65) of the tincture of ferric chloride has been added.

The acutely painful and tender joint of beginning acute rheumatism may cause the patient to rebel against this form of treatment but the administration two drachms (8.0) in divided doses during twenty-four hours of antipyrine salicylate will ease the pain so that the inunctions may be employed.

During the administration of salicylic acid in any form the urine should be examined daily and the quantity, specific gravity, and presence or absence of albumin and casts noted. It should be remembered that salicyluric acid reduces Fehling's solution, consequently such a reaction should not be interpreted as indicating glycosuria.

The above treatment usually results in the disappearance of the acute symptoms of the disease within a week.

In hospital practice the use of sodium salicylate—twenty grains (1.30)—and sodium or potassium bicarbonate—ten grains (0.65)—every four hours will be found to be attended with excellent results but in private practice such dosage is objectionable for obvious reasons. The alkali may be diminished when the reaction of the urine becomes alkaline. With this form of treatment it is very necessary that the bowels be kept freely open, that water be drunk copiously and that the condition of heart and kidneys be carefully watched. When the acute symptoms of the disease have abated the amount should be diminished. Certain authorities advocate the use of salicin, phenyl salicylate (salol) or methyl salicylate (oil of wintergreen) but these drugs seem to have no advantage over those above mentioned.

Certain feeble and anæmic patients are not benefited by the alkalies or salicylates and in these iron, cod liver oil, potassium iodide and other tonics and alteratives are indicated.

In gouty patients an attack of acute rheumatism seems to be best treated by a combination of colchicum and the salicylates.

When the salicylates are too disturbing to the stomach they may be given *per rectum* in dosage of twenty to forty grains (1.30 to 2.65) in solution every four or six hours. If larger doses are injected it is wise to add a few drops of tincture of opium.

Acetyl-salicylic acid (aspirin) is recommended as a substitute for the more commonly used salicylates, chiefly because it passes unchanged through the stomach, causing no disturbance to this organ, and is split up in the bowel; its taste is less unpleasant and it is less likely to cause tinnitus. Its dosage is from ten to fifteen grains (0.65 to 1.0) in powder or capsule every three or four hours. To secure its best effect often five grains (0.30) of heavy magnesium oxide should be exhibited thirty minutes after each capsule.

It may be said in conclusion that while various other drugs have their advocates the general consensus of opinion is that in salicylic acid and the salicylates we have the most efficacious treatment for acute rheumatism. Disadvantages they have, it is true, such as their tendency to disturb the stomach, heart and kidneys and to produce tinnitus aurium (which may be relieved by sodium bromide), or even deafness, and while their use does not prevent relapse, possibly because their administration is not long enough continued, nor heart complications, it does relieve the pain quickly and effectively, enables the patient to sleep and causes the fever to fall within a few days.

Occasionally for reasons not apparent the salicylates may fail or be not well borne. In this case the alkaline treatment, formerly in vogue, should be resorted to. Potassium citrate, potassium acetate, or sodium carbonate are the substances usually chosen, either singly or combined. The efficient dose is twenty grains (1.30) every three hours well diluted. If the stomach

is particularly tolerant for these twenty minims (1.30) of the official solution of potassium hydroxide, formerly known as liquor potassæ, well diluted at the same intervals may be substituted.

With regard to hyperpyrexia, energetic cold bathing—70° F. (21.1° C.)—or cold packs are the only means of treatment which have given good results. While the patient is being moved to undergo either of these procedures morphine may be given hypodermatically to control the pain and strychnine or alcohol may be used to counteract any tendency toward collapse.

The treatment of other complications, pericarditis, endocarditis, etc., will be dealt with in the sections upon these diseases.

While the febrile movement and the other acute symptoms persist the diet should be of milk, soups and semi-solids. A return to ordinary diet should not be allowed for at least a week after the subsidence of the joint symptoms.

Menzer has prepared a serum from streptococci from the tonsils of rheumatic patients and has used it in more than thirty instances with the following results: The treatment causes no pain or other local reaction as a rule. A general reaction, chilliness, fever, and skin eruptions, often resulted. The dose used was from one and one-half to five ounces (50.0 to 150.0). He believes that in acute instances the course of the disease was shortened, and he particularly states that the treatment seemed definitely to prevent severe endocarditis.

Local applications of various kinds may relieve the joint pain and swelling. The affected parts should be swathed in cotton covered by oiled silk which will protect from traumatism and maintain an even temperature. Often immobilization by means of splints and the use of sand bags and pillows will add to the comfort of the patient. It is to be remembered in the application of splints, etc., that mid-flexion is the most comfortable position in which to place the joint. Blisters of cantharides may relieve the pain in the acute stage and are often useful later in the disease. Care should be taken lest their action be carried too far. Injections of ten to fifteen drops (0.65 to 1.0) of an one percent. solution of phenol beneath the skin of the joint are advocated. These may be repeated once or twice daily and are said to relieve the pain to a considerable extent. Painting with tincture of iodine or applications of iodine ointment are likely to accomplish little, but a ten to twenty percent. ointment of ichthyol in lanolin is highly recommended. If wet dressings are applied the temperature should be warm. Among the most efficacious of these is Fuller's lotion (sodium carbonate six; laudanum eight; glycerin sixteen; water seventy-two parts), or equal parts of guaiacol and glycerin; fluid extract of belladonna twenty drops (1.30) to the ounce (30.0) of glycerin; or finally oil of wintergreen. These should be applied upon gauze compresses and renewed twice daily.

After the acute stage is passed the joints will be much benefited by

[Faint, illegible handwritten text]

6
80
16
72
figure

Boils and carbuncles
Staphylococcus pyogenus

aureus, Parkes, 1878

albus, Rosenbach, 1884

↓

properly applied massage and passive motion; warm and steam baths and galvanic electricity will also be found useful. The use of superheated air often gives speedy relief to marked disability. The only internal medication which by experience has been proven to have been beneficial is ten grains (0.65) each of potassium iodide and powdered guaiac, four times daily, exhibited in a starch wafer and followed by half a glass of plain water of artificial Vichy from a siphon.

SEPTICÆMIA AND PYÆMIA.

Synonym. Bacteriæmia.

Definition. Septicæmia and pyæmia are febrile diseases caused by the existence in the blood of pathogenic micro-organisms and characterized by recurring chills and irregular rises and falls of temperature. From these affections sapræmia or toxæmia are to be differentiated, the latter being the result of the local development of bacteria and the taking up by the blood of the toxic products of their growth. This process is really a septic intoxication since the bacteria themselves do not enter the blood. The distinguishing mark of pyæmia is the occurrence in the various tissues and organs of metastatic pus foci; in septicæmia this manifestation does not take place.

Ætiology. Surgical septicæmia is usually considered to be a result of infection by pyogenic micro-organisms, particularly staphylococci and streptococci, while to the physician the term septicæmia signifies a condition caused by the presence of any variety of pathogenic micro-organism in the blood and tissues while a demonstrable focus of infection may or may not be present.

The basis of pyæmia is analogous to that of septicæmia with the added factors of thrombosis and embolism. To these latter the occurrence of the metastatic abscesses is due. For instance, a septic phlebitis may occur with the formation of an infective thrombus from which bits of infectious matter may become detached and may be borne as emboli by the blood current until their final lodgment in a vessel the lumen of which is too narrow for their passage. Here such infectious particles become stationary and set up inflammatory processes which soon become abscesses. An example of this often occurs in infective or malignant endocarditis in which particles of the vegetations upon the valves may become detached and carried as emboli by the circulation, until, lodging in some perhaps remote part of the body, they result in abscesses.

Of the more common varieties of septicæmia, puerperal infection due to retained secundines, lacerated cervix or perinæum, scarlatinal or erysipelatous infection and the conditions which may result from severe forms of enteric fever, gonorrhœa, diphtheria, and other acute infectious diseases, should be mentioned.

Symptoms. Before the appearance of constitutional symptoms, those of the primary local lesion, if such is present, will be noticed. The onset of the septicæmia or pyæmia is usually marked by a severe chill during which

the temperature may rise to 103° to 105° F. (39.4° to 40.5° C.). Following this manifestation there is profuse sweating succeeding which the temperature may rise again. Chills, rises of temperature, and sweats succeed one another at intervals of one or two days, a general tendency of the fever to be higher at night being not unusual. The patient is prostrated, thirsty, suffers from anorexia and nausea, and perhaps vomits. Flesh is rapidly lost, exhaustion becomes profound, and a condition of semi-coma may supervene; transient erythematous eruptions may appear.

When no local lesion can be found and the patient either in health or after some illness suffers from chills, a persistent fever of a very irregular distinctively septic type, and possibly enlargement of the liver or spleen for which no other explanation can be found the term cryptogenic septicæmia may be applied.

Local symptoms are frequent in pyæmia and are due to the lodgment of the septic emboli. In the lungs these cause pain, rapid respiration, and cough; in the liver, pain with tenderness, enlargement of the organ, and jaundice; in the subcutaneous tissues, pain, tenderness and swelling, followed by abscess formation; in the joints, the usual signs of inflammation and the presence of intra-articular effusion; in the kidneys, albumin or blood in the urine. Emboli lodging in the brain, unless they shut off the blood supply of portions of this organ essential to the performance of the body functions, are not likely to be suspected. Emboli of the spleen cause pain in the side, tenderness and splenic enlargement, while metastatic abscesses of the pancreas are evidenced by deep pain and tenderness in the region of that organ.

The sources from which the embolus may come are as follows: External wounds, skin and bone diseases have the lungs as final lodgment, unless the bacteria or possibly very minute emboli can pass through the pulmonary capillaries when the distribution will be wider. Foci in the intestines or other part of the portal system produce abscesses in the liver, with or without any suppuration of the parts. Those from the female organs of generation, in the pelvic tissues, those from the left side of the heart and those whose size permits of passage from the right side of the heart through the pulmonary circulation to the left heart, lodge in the brain, kidneys, or spleen. Septic endocarditis is common in pyæmia and still further influences the distribution of the lesions.

Diagnosis. Of septicæmia and pyæmia usually this offers little difficulty when a primary focus is present. As a cause sometimes overlooked may be cited, a small area of osteo-myelitis which may have slight local but marked constitutional symptoms. When this aid is absent blood examination will reveal a considerable leukocytosis and cultures may show the presence of the causative micro-organism. Enteric fever may be differentiated by means of the Widal reaction and malaria by examination of the blood and by the test of quinine treatment. Gonorrhœa and prostatic abscess, as well as



tuberculous nephritis and pyelitis due to the presence of calculi, may be factors in causation. In malignant endocarditis a murmur is usually present, but if of the typhoid type there is much difficulty. Acute miliary tuberculosis more closely resembles enteric fever than septicæmia but must be borne in mind.

Prognosis. This is always serious in pyæmic conditions. Puerperal septicæmia is the least grave type of the affection if proper treatment is instituted. Chronic infections may last for months with irregular temperature and gradually increasing anæmia and emaciation until death supervenes.

Treatment. Much may be done in the way of prevention of puerperal septicæmia by proper cleansing of the patient's genital tract, the physician's hands and instruments, the complete removal of the contents of the uterus and proper after-treatment of cervical, vaginal and perinæal lacerations. Credé recommends the sterilization of the patient's genitals after parturition by first removing all clots, etc., and then inserting a vaginal suppository consisting of one and one-half grains (0.1) each of powdered talc and collargol and thirty grains (2.0) of cocoa butter; the vagina is then packed loosely with sterile gauze which later, with the introduction of another suppository may be renewed. If infection takes place douches of one to two to five thousand collargol solution are given and if there is any retention of placenta or membranes these should be removed by operation. In advanced infection the intravenous injection of two drachms (8.0) of collargol solution is advised. This last procedure may also be employed in septicæmia and pyæmia of other forms.

The early treatment of septicæmic and pyæmic states by surgical means is most important. Bier's method of producing hyperæmia, if there be an accessible focus, may be employed, but the direct surgical intervention is the method of choice. The primary focus should be rendered thoroughly clean by means of antiseptics, the curette or even the actual cautery. All collections of pus which can be reached should be opened and drained and even amputation of a limb may be necessary. Subcutaneous injections of antiseptics into the tissues may be given just as has been recommended in erysipelas. The bowels, kidneys and skin should be kept active in order that the poisons may be eliminated in so far as is possible and this may be furthered by the administrations of high rectal irrigations of hot saline solution given two or three times daily and two to four gallons (8 to 16 litres) at a time.

The temperature may be relieved by sponging with cool water and quinine sulphate may be given in doses of fifteen to thirty grains (1.0 to 2.0) daily. If the coal tar antipyretics are employed much caution is necessary because of their depressing effect. The sweating may be controlled by one-tenth of a grain (0.006) of morphine with one-hundredth of a grain (0.0006) of atropine, by agaricin one to two grains (0.065 to 0.13), or dilute sulphuric acid, fifteen to thirty drops (1.0 to 2.0).

Tincture of iodine twenty drops (1.30) daily in divided doses, given in syrup or rice-water is recommended and inunctions of Credé's ointment may be employed. Intravenous injections of collargol solution as advised above may be tried. Stimulation by means of alcohol and strychnine is always indicated and in the later stages hypodermatoclyses of hot normal saline solution may become necessary.

If the germ can not be isolated, treatment by means of antistreptococcus serum should never be omitted, especially in severe infections; five to eight drachms (20.0 to 30.0) may be injected every six to eight hours, the doses being diminished as improvement is manifested.

Success has followed the more recent efforts in the use of vaccines prepared from cultures of the germs obtained at the focus of infection and the amount administered, controlled by the opsonic index according to the methods proposed by Wright.

The diet throughout should be of the most nutritious and easily digestible character and of plentiful amount.

HYDROPHOBIA.

Synonyms. Rabies; Lyssa.

Definition. An acute specific infectious disease to which all warm-blooded animals are subject. It is communicable to man by inoculation and is characterized by tonic spasms usually beginning at the larynx.

Ætiology. The dog is particularly prone to this disease and when the affection occurs in man it is usually through the bite of this animal. Hydrophobia is also seen in wolves, cats, skunks and even cows and may be inoculated into rabbits, horses and other domestic animals.

While undoubtedly the result of infection with a micro-organism, the specific cause of the disease has not been isolated. The toxic substance exists in the central nervous system and in certain secretions, particularly the saliva, by means of which it is usually transmitted.

By no means all the individuals bitten by rabid dogs suffer from hydrophobia. Horseley gives the figures as fifteen percent., while the mortality among those bitten by wolves is much larger, being from forty to eighty percent. Children more frequently suffer from the disease than adults and bites upon the face and hands, probably because these parts are more often unprotected by clothing, which may wipe off the saliva before the teeth of the animal reach the tissues, are more likely to be followed by hydrophobia than those upon other parts. Punctured wounds are considered especially likely to be serious. It is certain that the majority of instances reported as hydrophobia are in reality not this disease at all and some go so far as to assert their skepticism as to its existence as a nosological entity.

Pathology. The characteristic morbid changes present in hydrophobia

are microscopical and are, so far as is known, confined to the nervous system, the rabietic virus likewise is present in the brain, cord and peripheral nerves but is not found in other organs and tissues. The pathological conditions consist of a dilatation of the vessels of the brain, medulla and upper cord and a collection of leukocytes in the peri-vascular sheaths and about the nerve cells, particularly those of the motor ganglia. Van Gehuchten and Nelis have described certain alterations in the peripheral ganglia of the cerebro-spinal and sympathetic systems consisting of a proliferation of the normal cellular elements which tends later to destruction and a replacement by round cells. Analogous changes are observed in certain other diseases as botulismus and diphtheria.

In 1903 Negri described as constantly present in the nerve cells of rabietic animals, certain bodies, which he believed to be protozoa, and which varied in size and shape according to their position in the cell. They are found especially in the cells of the hippocampus major and have been observed also in the cells of the pons, in Purkinje's cells and in cells in other situations. There is great difference of opinion as to the character of these bodies and also as to their diagnostic value, if any.

Inasmuch as there are no pathological appearances which are universally admitted to be characteristic of the disease, the diagnosis must remain uncertain. Many instances of tetanus, septicæmia and tuberculous meningitis have been reported as hydrophobia. Of fifteen consecutive deaths ascribed to hydrophobia and so recorded by the New York City Department of Health not one, after careful investigation, could fairly be ascribed to this cause.

Symptoms. The period of incubation is from six weeks to two months although, rarely, symptoms have been reported as appearing within two weeks after the infection, and incubation periods of a year or more have been observed.

The symptoms of the attack may be divided into three stages. Of these periods the first or *premonitory stage* is characterized by local manifestations about the bite, such as pain, tenderness and redness. The patient's mentality is depressed, he suffers from headache, anorexia and insomnia; he is feverish and perhaps melancholic and anxious. Any sudden noise or flash of light is startling. The voice is hoarse, the larynx may be congested and there may be dysphagia. The spasmodic stage follows the stage of premonition after about twenty-four hours. The patient is most excitable, restless and hyperæsthetic. Any peripheral irritation, even a sound or draught of air, brings on a pronounced reflex spasm. This affects chiefly the muscles of the throat and larynx and is particularly likely to be induced by the act of swallowing. The spasm is painful and is accompanied by marked dyspnoea. The fact that the spasm is so closely associated with the act of deglutition causes the dread of water. The saliva is usually increased and cannot be swallowed without causing a paroxysm. Maniacal excitement may accompany the spasm and

restraint may be necessary, but in the intervals the patient is quiet, his mentality is normal and he appears anxious lest he do harm during the seizures.

The temperature is elevated—from 101° to 103° F. (38.5° to 39.6° C.)—and the pulse is accelerated. This stage lasts from one to three days and is succeeded by the *paralytic stage*. This is characterized by exhaustion upon the part of the patient; he becomes quiet and gradually comatose. The cardiac action becomes weaker and weaker and death supervenes in syncope.

Diagnosis. This is not particularly difficult, the history and the length of the incubation period being important differential points.

Pseudo-hydrophobia or lyssophobia may closely simulate true rabies. This condition is likely to follow, particularly in neurotic individuals, the bite of any animal and it may even be characterized by paroxysms very like those of hydrophobia. The patient's symptoms usually ameliorate upon treatment although their duration is longer than in true rabies. The disease does not progress nor is there a rise of temperature. The diagnosis of hydrophobia may be assured by inoculating rabbits or guinea pigs with bits of the medulla of the supposedly rabid animal; the animals, if true rabies is present, will within fifteen to twenty days develop the paralytic type of the disease. It is advisable, however, to inoculate a second series of animals, since various drugs such as strychnine and atropine are capable of producing symptoms identical with those of dumb rabies. The changes in the peripheral ganglia of the cerebrospinal and sympathetic nervous systems of the affected animal are also characteristic. These may be examined and the diagnosis determined within a few hours after the animal's death; he must, however, die a natural death. The ganglion of the vagus nerve is usually examined and shows a proliferation and finally destruction of the normal cells and a replacement by round cells. It must be remembered that Marinesco has shown that identical changes occur in sausage poisoning (infection with the *bacillus botulismus*) and analogous ones are met in tetanus and diphtheria.

Supposedly rabid animals should not be killed unless absolutely necessary, but should be confined in order to ascertain if they are certainly affected with the disease.

Prognosis. In fully developed infections this is distinctly bad, the patient dying usually in from two to six days. Cauterization of the bite and the Pasteur treatment, when undertaken in time, are very effectual.

Treatment. Prevention of rabies is easily accomplished by the systematic muzzling of all dogs.

The bite having been inflicted the wound should be at once sucked, preferably by the patient himself, and the mouth immediately washed. Cauterization with a red hot iron, the Paquelin or the galvano-cautery should be practised as soon as possible. Failing these means pencils of silver nitrate, pure phenol or potassium hydrate should be employed; the wound should not be allowed to heal.



The Pasteur treatment is a method of prevention based upon incompleting experiments made by the distinguished French scientist whose name is immediately suggested by the word hydrophobia. It is founded upon his discovery that the poison of this disease has its seat in the nervous system, especially in the brain, medulla and cord. By inoculation of virus from the nervous tissues of rabid animals through a series of fifty rabbits a virus is produced which acts after an incubation period of seven days. This is termed "fixed virus." The spinal cords of the last rabbits of such series contain this virus in great intensity but its potency is quickly reduced by exposure of the cords to dry air, consequently they are dried in sterile glass vessels with potassium hydrate. In dogs inoculated with an emulsion made from fragments of medulla of diminished virulence and then with preparations of cord of higher potency immunity from inoculation by fresh cord substance is reduced. Working on this basis Pasteur inoculated human subjects, who had been bitten, with emulsion of two weeks old cords and on each successive day to the number of twelve gave other inoculations until those but one day old were used. By this treatment he succeeded in rendering the individual immune. At present the method employed in most Pasteur institutes consists in giving inoculations from cords of increasing virulence in rather more rapid successions.

During 1902, at the institute in Paris, one thousand, one hundred and six persons were treated, of whom three died from hydrophobia. Inasmuch as in one instance the disease declared itself before the end of treatment, this is excluded from both the number of persons treated and deaths, leaving the mortality at eighteen one-hundredths of one percent.

The time necessary for the treatment is fifteen days, two inoculations being given daily to ordinary patients. To those whose treatment has been instituted late or in whom the wounds are upon the face or head four to six inoculations per day may be given.

The following is a condensation of the instructions published by the institute at New York, for the benefit of those bitten by supposedly rabid animals.

Cauterization should be practised as soon after the bite as possible. Late cauterization is without benefit and possesses the disadvantage of inducing a false sense of security. The bite should be treated in other respects just like any infected wound.

The patient should be *immediately* sent to the institute, since each day of delay renders the prognosis less favorable. The inoculation is harmless and it is better to inoculate before learning the result of the biological diagnosis even though we treat those who do not possess the disease. The inoculation has the advantage of conferring immunity which persists for several years.

The dog or other animal should be confined and kept under observation

until it dies or recovers, and notes of its condition and progress should be sent to the institute. If it is impossible to keep the animal alive it should be killed, its head should be severed with a sterile knife, a portion of the medulla removed, and placed in a sterile bottle containing a previously boiled mixture of equal parts of glycerin and water. This bottle should be sealed and sent to the institute for examination and inoculation. A report upon the stomach contents of the animal should also be forwarded to the institute.

After the onset of the symptoms they should be controlled in so far as possible. The patient should be placed in a darkened and quiet room in charge of two attendants. While the milder sedatives such as the bromides and hydrated chloral may be effectual at first in overcoming the nervous irritability, it is wiser to employ inhalations of chloroform and hypodermatic injections of morphine from the beginning. The difficulty in swallowing may be relieved by the local use of cocaine but it is often necessary to administer both food and drink by means of the rectal tube.

TETANUS.

Synonyms. Lockjaw; Trismus.

Definition. An acute infectious disease characterized by repeated tonic muscular spasms of increasing intensity.

Ætiology. Tetanus occurs in human beings and in lower animals and is the result of the growth within the organism of a specific micro-organism, the *bacillus tetani* discovered by Nicolaier in 1884. This bacillus is found in the soil, especially in tropical countries, in the intestines of ruminant animals and in their excreta, in the fluids of putrefying wounds and in pus. Its portal of entry is usually by means of a wound, especially one of the hand or foot and a punctured or contused wound rather than one due to incision. While idiopathic tetanus may occur, in most instances a thorough search will reveal a slight loss of continuity of the skin which has afforded entry to the bacillus. Tetanus may occur as a result of umbilical infection in the new-born, *trismus nascentium*, and before the introduction of antiseptic dressings was a frequent cause of death of negro infants in the West Indies. The wound of the blank cartridge of the Fourth of July toy pistol frequently results in tetanus, not, however, from any infective character of the charge of the weapon.

The disease is predisposed to by exposure to cold and wet, and, while it affects all ages and both sexes, is more common in males. Epidemics have been occasionally met. The incidence of this disease is gradually diminishing.

The symptoms are not the result of the presence of the bacilli in the blood, for these remain and develop at the site of the wound; the toxins produced by their growth are responsible for the constitutional manifestations.

Some years ago a large number of infections was reported as being caused

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by injection of diphtheria antitoxin but investigation proved that these were due to antitoxin from one source only, and that the substance had not been prepared under proper precautions.

Pathology. There are no characteristic morbid changes in this disease. The wound is in no way typical and while granular degeneration of the nerve cells, inflammatory conditions of the nerves, and congestions, extravasations and exudates of various parts have been found, these are neither constant nor essential.

Symptoms. The usual incubation period is about ten days for the acute form. Chronic tetanus generally has an incubation period of more than two weeks. The onset of the disease may be marked by a chill or chilly sensations but this is not the rule, the initial symptoms being stiffness of the neck and jaw; mastication is difficult but not painful. In marked instances it may be impossible to force the jaws apart. The muscles of the abdomen, back and limbs become gradually stiff and the body becomes so inflexible that it may be raised as if made of a single piece of wood (*orthotonos*). If the spine is bent so that its convexity presents forward it is termed *opisthotonos*, if backwards, *emprosthotonos*, and if the arching, somewhat rarely, is laterally it is called *pleurosthotonos*. *Risus sardonicus* may be present as evidenced by a drawing out of the corners of the mouth and elevation of the eyebrows; paralysis of the muscles of the face, dysphagia with laryngeal and oesophageal spasm may be noted; this is the so-called head tetanus of Rose and usually is the result of a wound of the head with injury to the fifth nerve.

Paroxysms may be induced by a touch, a breath of air or any slight noise; during these the muscles of the trunk contract, producing bending of the spine so that the body is held in the various positions above enumerated. The tongue may be bitten in spasms of the jaw or, in marked instances, the chest may be so compressed by muscular contraction as to cause severe pain and rapid respiration. The opening of the larynx may be contracted producing a condition of asphyxia. Extreme pain is an accompaniment of the paroxysm and the body may be bathed in perspiration. Between the attacks, which occur at intervals varying from a few minutes to several hours, the patient may be able to walk about but the relaxation is not complete.

Usually the temperature is only slightly above normal but may rise to 106° F. (41.1° C.) or to 110° F. (43.4° C.) or even higher just before death, which may occur during a paroxysm, from asphyxia or cardiac failure, or from exhaustion. The pulse and respiration are, as a rule, accelerated. The mind remains clear. Constipation is frequent and often serious since attempts at relief are likely to induce the paroxysm.

Diagnosis. This, particularly in traumatic tetanus with a history of source of infection, is usually not difficult; trismus occurs in tetanus but not in hydrophobia, and in strychnine poisoning, in the intervals of the paroxysms which occur early, there is complete relaxation and the convulsive attacks

affect the limbs more than in tetanus. Bacteriological tests may be employed to assure the diagnosis.

Prognosis. In traumatic tetanus this is bad, the mortality being about eighty percent. as against less than fifty percent. in the idiopathic form. Death usually takes place within six days after the onset; patients surviving longer than this period are likely to recover. The disease is especially fatal in children. A prolonged incubation period is a favorable sign as are also a localization of the spasms in the face and neck and an absence of elevation of temperature. In the newly born recovery is exceptional.

Treatment. This consists first in thorough cleansing and cauterization of the wound. Particularly should all bits of wadding, powder, etc., be removed from blank cartridge wounds; the actual cautery, phenol or silver nitrate should then be used and the wound dressed antiseptically. Dusting the wound with powdered tetanus antitoxin has been suggested, and a prophylactic injection of at least five hundred units of tetanus antitoxin should be given. This amount is sufficient for immunization and should be injected so soon as the injury is attended to. The patient should be placed in a darkened room, as far removed from irritant influences as possible; he should receive no visitors, one attendant being sufficient, and the strictest quiet should be enjoined.

While the results obtainable from antitoxin treatment are not all that could be hoped, injections should be instituted in all instances. It has been shown that the route of the tetanus toxin to the nerve centers is along the motor nerves and less directly through the blood and lymphatics, and since only that portion of the toxin which is in the blood and tissues outside the nerves can be reached, the antitoxin should be injected directly into the veins and into the tissues about the focus of infection. The diagnosis having been made by means of bacteriological tests, injections should be immediately begun and continued daily for at least two weeks from date of the injury. The injections should be into the median basilic vein and each dose should consist of from two and one-half to five drachms (10.0 to 20.0). It is better to give too large doses than too small. Intra-neural injections, the motor nerves supplying the injected region having been exposed as near the spinal cord as possible, of from five to twenty minims (0.30 to 1.30) are advised in connection with the above treatment. The cauda equina may also be injected by means of lumbar puncture, certainly if the injection has been given directly into its nerves being evidenced by twitchings. In urgent instances the injections may be given directly into the cord itself at the level of the sixth or seventh cervical segment, the risk of injury being less than that of the spread of the infection. After these more drastic measures attention should be given to the local lesion and the surrounding tissues should be fully injected with the antitoxin. The entire process described above may be repeated daily until there is subsidence of the symptoms. Anæsthesia is

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of course necessary in this treatment. Subdural injections of tetanus antitoxin by means of trephining have been practised but these would seem in no way superior to the less difficult injections into the tissues, veins, nerves and cord.

Excellent results have been reported from the employment of subcutaneous injections of an emulsion of rabbit's brain, the basis of the treatment being the fact that the tendency of tetanus toxin is to become incorporated and fixed in the nerve structures.

At least one patient has been cured, after the antitoxin treatment had seemed to fail, by the removal of cerebrospinal fluid by means of lumbar puncture and injecting into the subarachnoid space forty-five minims (3.0) of a solution containing one and one-half grains (0.1) of beta-eucaine, one-third of a grain (0.02) of morphine hydrochloride and three grains (0.2) of sodium chloride. An amelioration was immediately noted and the process was repeated several times, the patient ultimately recovering.

Very recently treatment by means of the injection of a solution of magnesium sulphate into the spinal canal by means of lumbar puncture has been suggested and the few results so far reported seem to justify the method; twenty-five and twelve and one-half per cent. solutions have been employed, the amount injected being about fifteen minims (1.0) for every twenty-five pounds (800.0) of the patient's weight. Repeated injections may be given and the treatment is said to restrain the convulsions and relieve the pain, thus preserving the patient's strength and preventing excessive metabolism and heat production; the spasm of the muscles of the jaw is lessened, thereby permitting the administration of food by mouth. The action of the salt is continued for a considerable period without depressing the heart and no ill-effects are likely to be produced save an inhibition of the action of the bladder, rendering catheterization necessary. It is possible that the drug exerts some chemical action upon the toxins of the disease but more probably its effect is purely symptomatic. This form of treatment may be employed to advantage in connection with that by means of tetanus antitoxin.

Treatment by means of the repeated hypodermatic injection of two percent. solution of phenol is said to act favorably upon the nervous system and, to a certain extent, to neutralize the effect of the toxin of the disease.

Amputation of the wounded limb has its advocates.

With regard to the treatment of the paroxysms it may be said that they are best controlled by chloroform inhalations but they may be avoided, or at least decreased in intensity, by the use of various hypnotics. Of these morphine given hypodermatically is the most efficient and the patient may be kept under its influence. Hydrated chloral given together with the bromides may prove effective; physostigmine salicylate one sixty-fourth of a grain (0.001)—given every three to six hours and curare—one twenty-fifth of a grain (0.0026)—administered hypodermatically, the dose being gradually, but with caution, increased, may benefit the condition.

The resulting stiffness frequently observed during convalescence may be markedly relieved by the tincture of conium in doses gradually increased until the physiological effects are noted.

Stimulation is necessary when the heart and circulation become depressed and warm baths may aid in relaxing the spastic condition and are grateful to the sufferer.

The nourishment should be maintained at the highest possible level since it is said that tetanus antitoxin does not exert its best influence in conditions of impoverished nutrition. The diet, however, must of necessity be chiefly of fluids and feeding by the nasal tube or *per rectum* becomes imperative when deglutition becomes difficult or impossible.

ANTHRAX.

Synonyms. Malignant Pustule; Wool Sorter's Disease; Splenic Fever; Splenic Apoplexy.

Definition. An infectious disease of animals, particularly cattle and sheep, and transmissible to man.

Ætiology. This disease in animals is widespread but is less common in America than in Europe and Asia. In man it occurs as a result of infection through the skin, lungs or digestive tract and is most often seen in those who work about animals or animal products, such as shepherds, hostlers, tanners, butchers, etc. The contagium is transferred to man by means of the hides, flesh, blood and secretions of affected animals and, while the possibility of contracting the infection through an intact skin or mucous membrane is to be considered, it is probable that a solution of continuity of the integument is necessary for a successful inoculation.

The specific cause of anthrax is a bacillus of great vitality and the largest of the pathogenic bacteria. It is termed the *bacillus anthracis*, was discovered by Davaine in 1863, and exists in great numbers in the blood and tissues of the infected subject. While the bacilli themselves may be easily destroyed, their spores are very resistant to disinfecting agents. Animals acquire the disease through abrasions such as insect bites, etc., by feeding upon the flesh of other animals dead from the infection and by grazing over fields where the bacilli are present, for these have been found upon the herbage over the buried bodies of animals which have died of anthrax.

Symptoms. The incubation of anthrax is usually about one week and for convenience in description the disease may be considered as occurring in two forms, the external and the internal.

External Anthrax. (a) *Malignant pustule* occurs as a result of inoculation and most often begins upon the exposed surfaces of the face, hands or arms. The first symptom is pain, itching or burning in character, at the site of inoculation. Soon a reddened spot appears which quickly becomes papular and then vesicular, the vesicle containing clear or bloody serum. The

surrounding tissues become indurated and, the original vesicle bursting, other vesicles develop about the indurated area. The induration extends and becomes darkened at its center, a brown eschar usually appearing within thirty-six hours. The neighboring tissues are oedematous and, the infection spreading along the lymphatic channels, these become reddened, swollen and tender and the adjacent lymph ganglia are enlarged.

There is accompanying constitutional disturbance, the temperature and pulse rate being elevated and other symptoms of an acute infection being present. Later the temperature may fall below normal and in fatal instances death supervenes after from three to five days. In favorable instances with mild constitutional symptoms the surface of the vesicles may become dry and with the induration gradually disappear or the eschar may slough away leaving the wound to heal.

(b) *Malignant anthrax œdema* usually begins in the eyelids, spreading thence to the face; it also may occur in the hands or arms; papules and vesicles do not appear but there is marked œdema which may go on to gangrene. The constitutional symptoms may precede the local manifestations and are usually of severe type. Recovery from this form of the disease is practically unknown.

A marked characteristic of both forms of the infection is the absence of mental anxiety, the mind often remaining wholly unaffected.

Internal anthrax also occurs in two forms. (a) *Intestinal anthrax* or *mycosis intestinalis* results from the ingestion of the meat or milk of infected animals or from the transference of the contagium of external anthrax to the digestive tract. There is likely to be a chill at the onset which is succeeded by the symptoms of intense intoxication, such as vomiting, diarrhœa with bloody stools, general pains, fever and abdominal tenderness. In the severe infections the respiration is difficult, cyanosis and pronounced mental symptoms are present and there may be extravasations of blood from the mucous membranes or petechial hæmorrhages into the skin. There is splenic enlargement, the blood is dark, remains uncoagulated for a considerable period *post mortem* and, in the later stages of the disease, may contain the bacillus. Convulsions may be observed shortly before death.

(b) *Wool sorter's disease* is seen amongst those who work in wool or hides, especially those imported from South America or Russia, and is the result of the inhalation or of swallowing the contagium. There is seldom an external lesion and the onset of the infection is usually abrupt with a chill, high temperature, general pains and prostration. The heart action is rapid and feeble and there is dyspnœa and thoracic pain. Cough with accompanying physical signs of bronchitis is not infrequent. Death may occur in collapse within twenty-four hours or the disease may be prolonged with vomiting, diarrhœa and cerebral symptoms. In such infections the capillaries of the brain have been found to contain the bacilli in great numbers.

Rag picker's disease is the name given to a pulmonary and pleural anthrax infection which is accompanied by a general intoxication. The symptoms are high fever, followed by collapse in apyrexia, spasmodic and painful cough, often cyanosis, with feeble and irregular heart-action.

Diagnosis. Of anthrax of the external form, this may be made from the local appearances and from the history. Bacteriological examination of the contents of the vesicle may reveal the presence of the specific micro-organism. Inoculation experiments are also useful. Internal anthrax is less simple of diagnosis but may be suggested by a history of exposure.

Prognosis. This is distinctly bad, particularly in the internal types. In wool sorter's disease recovery is likely to follow if the patient survives a week.

Treatment. Much may be done in the way of prevention by the disinfection of hides, wool, rags, etc., by means of steam under pressure. Hides, unfortunately, are damaged by this process. All animals dead from the disease should be burned, not buried, grazing over infected pastures should be prohibited and the thorough disinfection of infected buildings is of much importance.

The site of the lesion in external anthrax should be excised if possible or, if not, deep crucial incisions are to be made and followed by cauterization with the thermocautery, phenol or a solution of potassium hydrate. The wound should then be dressed with a strong solution of phenol or powdered with pure mercury bichloride. General or local anæsthesia may be necessary. Injections beneath the skin of the surrounding parts may be effectual in preventing the spread of the infection. Such solutions as one-half of one percent. phenol; five percent. tincture of iodine; or iodine one, potassium iodide two, water one thousand parts, may be injected several times daily. Mercury bichloride is also useful in this connection. The technique of such injections is as follows: At a distance of about one-half an inch from the margin of the indurated area the needle is inserted and the injection made; other injections are given outside the periphery of the inflammation at such intervals that the tissue infiltrated with the chosen solution shall act as a continuous barrier to the progress of the infection. The injection of the official compound solution of iodide into the enlarged lymph glands is also advised.

Internally we may give thirty drops (2.0) of tincture of iodine daily or one-half of a drachm (2.0) every two hours of the mixture of iodine and potassium iodide mentioned above. Stimulants such as alcohol and strychnine should be prescribed as indications arise and the dietary should be as plentiful, nutritious and as digestible as possible.

Internal anthrax is likely to be little influenced by treatment, although quinine in large doses has been recommended. The bowels should be freely moved at the onset and kept open during the course of the disease in order that, if possible, the toxic matters may be removed; the treatment described

above may be employed and the free exhibition of intestinal antiseptics is advocated.

A serum for the treatment of anthrax has been elaborated by Sclavo and from the results claimed would seem to merit a trial.

GLANDERS.

Synonyms. Farcy; Malleus Humidus.

Definition. An infectious disease particularly of the horse but communicable to other animals such as the sheep, rabbit, cat, dog and mouse; cows enjoy immunity. The disease is manifested by nodular growths in the nostrils (glanders) and under the skin (farcy).

Ætiology. The disease is rare in man but may be seen in stablemen and others who work about horses. Its specific cause is a micro-organism, the *bacillus mallei*, described by Löffler and Schütz in 1882. The infection is transferred to man by inoculation through an abrasion of the skin or through a mucous membrane, the contagium being given off in the discharges from the diseased animal.

Pathology. The characteristic lesion of glanders is the appearance of granulomatous tumors of varying size, composed of epithelial and lymphoid cells and containing the bacillus. These tumors occur beneath the skin and on the mucous membranes where they soon break down forming, respectively, abscesses and ulcerations. The nodules have also been observed in the viscera and in the nervous and osseous systems.

Symptoms. Acute and chronic forms of both glanders and farcy occur in man.

The incubation period of *acute glanders* is from three to five days. The onset is characterized by the usual symptoms of beginning febrile disease; at the site of the infection there are redness and swelling, the nasal mucous membrane in the vicinity becomes first dry and congested, the appearance of the nodular tumors rapidly follows, and these soon break down, becoming ulcers which discharge a muco-purulent or bloody secretion. The infection may cause severe frontal headache due to accompanying involvement of the sinuses in this neighborhood. The submaxillary and cervical lymph glands become enlarged and may suppurate and the inflammatory process spreads to the nasal septum, to the mouth, pharynx and even to the lower air passages, causing pain on swallowing, cough and foul expectoration, and even pneumonia. A papular eruption, which soon becomes pustulous and may be mistaken for smallpox, may appear upon the face and upon the skin over the articulations.

Chronic glanders is difficult of diagnosis. Its symptoms resemble those of a chronic rhinitis or laryngitis for either of which it is likely to be mistaken. There are ulcerations of the nasal mucous membrane. The diagnosis may

be made by inoculating the peritonæum of a guinea pig with the nasal secretion or with a culture grown from this substance. If glanders is present the testicles of the animal become swollen and inflamed within a few days and ultimately suppurate. The guinea pig dies within three or four weeks and nodules are found in the abdominal organs.

Acute farcy is evidenced by the symptoms of an acute infection accompanied by a subcutaneous nodule or an ulcer with a foul secretion. The neighboring parts become congested and œdematous and adjacent lymphatics are involved; "farcy buds," which are subcutaneous nodules along the course of the lymph vessels, develop and may suppurate. Intra-muscular abscesses and articular swellings may appear and rarely a pustular rash occurs. The nose is not affected and the urine may contain the bacillus.

Chronic farcy is characterized by localized subcutaneous nodules, usually occurring upon the extremities; their development is sluggish and while they break down, forming abscesses or ulcers, there is no marked lymphatic involvement. The course is protracted and pyæmic symptoms or acute glanders may develop.

Diagnosis. In acute glanders this is seldom difficult, being readily distinguished from pyæmia and smallpox; but in the chronic form is less simple, being sometimes confounded with tuberculosis or syphilis. Recently the agglutination test has been employed since it has been proven that while normal horse serum agglutinates glanders bacilli in a dilution of one to two hundred, that of a horse affected with glanders will agglutinate an one to one thousand dilution. Mallein, a product of the growth of the glanders bacillus analogous to the tuberculin of tuberculosis, may be employed in diagnosis. Inoculation with this substance causes a rise of temperature when glanders is present, a rise in horses of 3.5° F. (2° C.) being considered proof that the animal is diseased, while an elevation of 1.25° F. (0.75° C.) is considered suspicious. Direct animal inoculation will quickly determine the presence or absence of the infection and implantation of cultures from the secretion upon cooked potatoes shows within three or four days an amber colored film, becoming by the end of a week red and encircled by a pale green area.

Prognosis. In the acute forms this is almost invariably fatal. In the chronic types about one-half of the patients recover.

Treatment This consists in the early excision and cauterization of the lesion; antiseptic dressings should then be applied. In the nasal form of the infection antiseptic sprays and gargles of dilute phenol or of solution of hydrogen dioxide are to be employed. Farcy buds should be incised and dressed antiseptically. Mallein has been employed in animals and has been administered internally to human beings with no very positive results. The patient's nutrition should be kept up by a supporting diet, symptoms should be combated as they arise and stimulation is to be prescribed when indicated.

ACTINOMYCOSIS.

Synonyms. Lumpy Jaw; Big Jaw; Bone Tumor; Swelled Head.

Definition. A chronic infectious inflammatory disease of cattle and pigs, transmissible to man and caused by the *streptothrix actinomyces* or ray fungus discovered by Bollinger in 1877 and the identity of the disease in man and cattle was established by Ponfick in 1879.

Etiology. The disease is common in cattle, is more frequently seen in man in Germany than in England or America and affects males more frequently than females. The fungus probably reaches the human organism upon the ingested food. Direct infection with meat or milk has, however, never been proven. It has been shown that the disease may be conveyed to cattle upon oats and other grains and it is not improbable that man may contract the disease in the same manner. The infection takes place usually through the mouth or throat, rarely through the skin or respiratory passages.

Pathology. The characteristic lesion is a miliary nodule, made up of a central mass of fungi radiating in all directions and surrounded by granulation tissue. The size of a single nodule is about that of a millet seed but numbers of these may be aggregated into tumors the size of a base-ball; about the larger tumors the connective tissue is greatly proliferated and finally suppuration with abscess formation takes place. In the liver it forms a peculiar honeycombed abscess.

Symptoms. (a) *Of the digestive tract.* The infection usually takes place through the mouth or decayed teeth, the jaw becomes swollen and the face so enlarged that the condition may be mistaken for sarcoma; sinuses discharging pus are often present. Rarely the tongue, pharynx, intestines or liver may be involved primarily, or secondarily as a result of metastasis. Actinomycotic peritonitis and appendicitis have been observed and the fungi have been demonstrated in the stools. Actinomycosis of the liver is rare, usually secondary to an intestinal lesion, although the latter may not be discoverable.

(b) *Pulmonary actinomycosis.* Infection of the lungs by the ray fungus is not infrequent and occurs in three types. First, a form with lesions resembling those of chronic bronchitis, the sputum containing the fungi. Second, a miliary form in which tubercles occur resembling those due to the bacillus of Koch but in which the actinomyces are demonstrable. Third, a destructive form characterized by interstitial lesions and abscesses which may form demonstrable cavities. The pulmonary type of the disease may occur synchronously with involvement of the jaw or other parts. The cough is accompanied by a foetid expectoration, in which the actinomyces may be demonstrated, and fever, which is usually septic in character if suppuration has taken place. The course of the infection is protracted, the average duration being about ten months; recovery is rare.

(c) *Actinomycosis of the skin* is a chronic condition resembling that of tuberculosis characterized by the development of cutaneous swellings which break down and result in ulcers in the discharge of which the fungi have been found.

(d) *Cerebral actinomycosis* is a very rare type of the disease, presenting symptoms resembling those of tumor. It is characterized by the formation of abscesses in the brain, the pus of which may contain the mycelium.

The symptoms of importance are a fever of irregular type with the addition of others dependent upon the site of infection. If the lungs are involved cough is prominent. If the intestines are the site pain and digestive disturbances are suggestive.

Diagnosis. This can be assured only upon demonstrating the fungi in the pus or other discharges from the lesions; unless this can be done the condition is likely to be confounded with pyæmia, which, in actuality, it is.

Actinomycosis of the jaw may be differentiated from sarcoma by its more protracted course, greater tendency to suppuration and the presence of actinomyces.

Treatment. In general this consists in the administration of potassium iodide in doses of from thirty to sixty grains (2.0 to 4.0) daily, gradually increased to two drachms (8.0) and the maintenance of the patient's strength by nourishing food, arsenic and other tonics. In pulmonary actinomycosis, in addition to the internal administration of potassium iodide, antiseptic inhalations should be employed as in foetid bronchitis (*see* p. 685) and the vapor of iodine is particularly effectual. The internal measures applicable in the foetid form of bronchitis are also useful and especially the preparations of eucalyptus. Actinomycosis of the intestine necessitates attempts at achieving intestinal antiseptics.

If the tumor is so situated as to allow of excision this should be performed and the dead bone and infected tissues removed, the wound and sinuses drained and irrigated with a solution of iodine and potassium iodide or of ten percent. of iodoform in glycerin. Cauterization of the infected tissues with zinc chloride is also recommended. Intestinal actinomycosis with localized pus foci necessitates laparotomy and, in the cerebral type, if the symptoms suggest an abscess which can be localized, surgical interference is imperatively indicated.

BLASTOMYCOSIS.

Definition. A chronic inflammatory disease characterized by various lesions, particularly of the skin, and due to infection with fungi of the yeast variety termed *blastomycetes*.

Ætiology. As stated above this affection is the result of the action of the specific fungus, which is a rounded, ovoid or irregularly shaped body possessing a homogeneous capsule and made up of finely or coarsely granular

protoplasm which sometimes contains a clear vacuole of varying size. The fungi may be obtained from the diseased tissues and from the pus of the blastomycetic abscess. Organisms from different patients often differ in their cultural behavior, consequently it is very possible that this type of fungus may later be differentiated into separate classes. The earliest description is that of Wernicke in 1892.

Among the first blastomycetic infections to be observed were those affecting the skin; here previous traumatism seems, in some instances, to have been a predisposing factor in the ætiology. Involvement of the various viscera has followed the skin infections in some instances, while in others the organism seems to have effected its first entry by means of the lungs. In the skin infections, the lesions being in the form of subcutaneous miliary abscesses, it is easy to account for the subsequent visceral involvement, for here the infection probably is carried by means of the blood or the lymph circulation. Primary pulmonary infection doubtless follows the inhalation of the fungus, and its lodgment and subsequent development in the bronchial tract ensues.

Pathology. The skin in this affection exhibits lesions similar to those of tuberculosis; there are purplish elevated areas which are soft and spongy and from the bases of which drops of pus may be expressed; there may also be small raised nodules not larger than a pea and reddish in color. Microscopic sections show epithelial hyperplasia, tiny intra-epithelial abscesses, a granulomatous condition of the corium, and the presence of the specific fungus.

The lung of pulmonary blastomycosis is characterized by a surface studded with grayish-white or yellow nodules; these are firm in texture, are slightly elevated and resemble miliary tubercles. Both lungs are usually involved but often not to an equal extent. There may be pleuritic adhesions. Section of the lung shows a fairly uniform distribution of the nodules throughout the pulmonary tissue; a tendency to the formation of clusters is not unusual. The lung structure between the nodules appears normal. The miliary bodies are yellowish at their centers and upon being squeezed exude a small amount of pus; they are situated in the connective tissue surrounding the bronchi and the blood-vessels.

Symptoms. These vary with the situation and number of the lesions but, since in all reported instances of generalized blastomycosis the pulmonary manifestations have been most prominent, the symptomatology is chiefly referable to the lungs. Cough is constant but variable in intensity and frequency; rarely it may be so slight as to attract no attention. Expectoration is usually present. It may be purulent, muco-purulent or blood stained; the blood probably results from the severity of the effort of coughing, for there is no tendency to the development of cavities. Fungi may be demonstrated in the sputum. Dyspnœa may be present, differing in degree with the extent of the lesions; the respiration and pulse are usually accelerated. There

is generally a rather constant elevation of temperature, dependent, as in tuberculosis, upon the presence of pathogenic bacteria and upon the absorption of their products. Temperature of pyæmic type has been observed. Chilly feeling and sweatings occur when there is a mixed infection.

Physical Signs. These are in no way characteristic, but dulness and bronchial breathing over the lesions are usually present.

Diagnosis. This depends upon the demonstration of the specific fungi in the sputum and upon the presence of the typical skin lesions. Doubtless many of these instances are even now classed as tuberculous.

Prognosis. The disease may last for months or years but is probably ultimately fatal in all instances when the lungs are involved. If it is limited entirely to the skin, healing is likely to result but with extensive scar formation.

Treatment. The nursing, diet and general hygiene of the patient should be conducted upon the same lines as those applicable in pulmonary tuberculosis, and the sputum should be properly disinfected. Just as in pulmonary actinomycosis the drug which is our chief stay is potassium iodide; large doses should be employed, the usual amount being from one drachm (4.0) to one and a half drachms (6.0) daily. The iodine is said to cause a destruction of the tissues about the fungus in actinomycotic growths with the result that the organism may be discharged if a clear exit is provided and it is possible that a similar process may take place in blastomycetic infections. The employment of Röntgen-ray exposures is said to increase the absorption of the iodine, consequently it may be employed in connection with the administration of the iodide. Exposures have been made as frequently as every two days, but in the present status of our knowledge of the possible evil effects of this form of treatment it should be given by none but those who are expert in its manipulation and even then with great care.

The inhalation of the vapor of copper sulphate solution from a nebulizer or in the form of steam has been suggested on account of the destructive action that this substance is known to possess over certain vegetable growths, notably algæ. The spray should not be so strong as to irritate the lining of the respiratory tract, but it should be used as continuously as possible.

Subcutaneous abscesses should be incised and drained; if extensive lesions are demonstrated in the lungs these also may be treated surgically; the wounds should be allowed to remain open, in order to allow free exit to the infectious matter which may be assisted by the administration of potassium iodide.

EPIDEMIC STOMATITIS.

Synonyms. Foot and Mouth Disease; Aphthous Fever.

Definition. An acute infectious disease of animals most frequently seen in cattle, sheep, and pigs, occurring rarely in dogs, cats and fowls, and char-

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acterized by the presence of vesicles and ulcers upon the buccal mucous membrane, in the clefts about the feet and upon the udders. It may occur in epidemics, when it spreads with great rapidity and may entail considerable loss to the grazing interests. The infection is transmissible to man.

Etiology. The disease occurs in human beings as a result of drinking the milk, which may be yellowish in color and of a nauseous, bitter taste, or, more rarely, of eating cheese or butter, from infected cattle, and through contact with the contents of the vesicles in the mouths or upon the teats of the diseased animal. Meat from such animals does not appear to be infectious. No micro-organism has yet been demonstrated to be responsible for this disease and, while it may be of microbic origin, the specific cause is probably too small to be visible through the microscope since the content of the vesicles retains its infective properties after passage through a porcelain filter which is impermeable to the most minute bacteria. Animals may be rendered immune by a vaccine elaborated by Löffler.

Infants may be infected by milk from diseased cows and a connection has been suggested between the aphthous stomatitis of children and foot and mouth disease.

Symptoms. After an incubation period of from three to five days the onset is marked by a rise in temperature, malaise, anorexia and digestive disturbance; these may be preceded by a chill or chilly sensations. Vesicles containing a yellow serum appear upon lips, tongue and pharynx; the mouth is hot, its lining is red and swollen and there may be interference with speech and deglutition; the saliva is increased. An eruption of vesicles, which may become pustules, appears upon the skin particularly of the fingers and toes, with extreme rarity about the nipples in women and possibly over other parts of the body. This rash may be mistaken for that of smallpox or for vaccinia if it occurs after vaccination. But in no other disease is an eruption found in the mouth and on the extremities, and which so universally spares the rest of the body. The vesicles within the mouth may go on to ulceration.

Prognosis. This is good, except in young infants, generally coming to an end within a week.

Treatment. Prevention consists in boiling all suspected milk and insistence upon cleanliness in the care of animals. No reliable method of immunization has been discovered.

The diseased mucous membrane should be kept clean by means of simple antiseptic mouth washes of saturated solution of potassium chlorate, of boric acid or of diluted liquor antisepticus. The ulcers should be powdered with burnt alum or, if this is inefficient, touched with pencil of silver nitrate. The cutaneous eruption necessitates the employment of mild lotions of one to five or ten thousand mercury bichloride solution and of dressings of sterilized gauze. In other regards the treatment is wholly symptomatic.

MILK SICKNESS.

Synonyms. The Trembles; The Slows.

Definition. An acute, infectious disease of man and the lower animals formerly common in the Western states and at present sometimes seen in North Carolina, Ohio, Indiana, Kentucky, West Virginia and Michigan. Its frequency has been lessened since the forests have been replaced by cultivated land. In animals it is termed "the trembles."

Ætiology. Its specific cause is not known but the infection is transmitted to man through the milk, cheese and butter, as well as by the means of the flesh, of diseased animals. The contagium may have its origin in the soil and a bacillus has been found by Jordan and Harris, in 1908, the *bacillus lactimorbi*, by cultures of which the disease may be transmitted to animals. The disease is more frequent in the late summer and autumn.

Pathology. No characteristic morbid changes have been described, few necropsies upon human beings having been performed.

Symptoms. After an indefinite incubation period and prodromal symptoms lasting a few days and consisting of sensations of fatigue, increasing malaise, headache and loss of appetite, the onset of the disease occurs. This is sudden and marked by nausea and regurgitant, never fæcal, vomiting, gastric pain, obstinate, sometimes absolute constipation, thirst and moderate rise of temperature. The mouth is dry, the tongue tremulous and swollen and the breath is foul and it and the patient possess a characteristic odor. The pulse at first full and rapid, later the typhoid state may supervene, when it becomes small and weak, and pronounced cerebral symptoms appear, as restlessness, irritability and coma. Convulsions may be noted. The severer and more acute infections may terminate fatally within a few days, in other instances the disease may be protracted for three or four weeks.

Diagnosis. This is usually made by exclusion and upon the fact that "the trembles" is prevalent among the cattle of the neighborhood.

Prognosis. This is unfavorable, the disease frequently proving fatal.

Treatment. Prevention consists in the avoidance of all possibly infected milk, meat or other foodstuffs. The treatment is symptomatic and eliminative; the administration of fifteen grains (1.0) of ground calcined deer horn every six hours, which has a local reputation, is suggested. Calomel should not be given as a purge; castor oil or magnesium sulphate is preferable. Stimulation is usually necessary, here alcohol, strychnine, etc., may be employed. The diet should be arranged in accordance with the principles usual in infectious diseases.

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GONORRHOEAL INFECTIONS.

The consideration of infection of the male urethra and of the vagina with the gonococcus is without the scope of this work, but this fact does not render less the importance of the disease. Gonorrhœa is without doubt one of the greatest scourges with which the human race has to contend and its effects reach far beyond the seat of the primary inflammation. The extent of the ravages of the infection are prominently brought to notice by the recent statement of an eminent gynecologist that probably not less than eighty per cent. of the married women of New York City are suffering from pelvic disorders of various characters, the result of infection from their husbands whose youthful or later indiscretions become thus responsible for ills that render a woman's life miserable and end in sterility or even more serious conditions. The time is past when a specific urethritis is to be looked upon as little more grave than a cold in the head and considered a part of the education of every young man. It has been demonstrated that the gonococcus remains active in the urethral discharge long after this ceases to be purulent in character and even after years, when the host of this insidious organism believes himself wholly cured, is capable of as much mischief as when the infection was in its early stages. A large proportion of the blind owe their infirmity to a gonorrhœal conjunctivitis acquired at birth. Acute conjunctivitis from gonorrhœal infection is prevented with the greatest difficulty from leaving permanent disfigurement and disability.

GONORRHOEAL SEPTICÆMIA AND PYÆMIA.

These conditions do not differ, so far as symptoms are concerned, from analogous states resulting from other microbic infections, except that they are associated with genito-urinary inflammations. The gonococcus, first described by Neisser in 1879, may be demonstrable in the blood and the course of the affection varies in severity. The irregular temperature may continue for a number of weeks, and, unless the endocardium becomes involved, recovery may take place; on the other hand, rapidly fatal infections occur, usually associated with localized pus collections in different parts of the genito-urinary system.

The most important and frequent local manifestations of general gonorrhœal infection are gonorrhœal endocarditis and arthritis.

(a) **Gonorrhœal endocarditis** is a frequent and serious condition and for its more complete discussion the reader is referred to the section upon malignant endocarditis (see p. 612). Gonococci may be demonstrated in the blood and in the ulcerations or verrucous growths upon the valves.

Other cardiac lesions such as pericarditis and myocarditis may be associated with the endocardial inflammation.

• (b) **Gonorrhœal arthritis** is a septic inflammation of a joint due to the gonococcus and is one of the most serious of all the complications of gonorrhœa in that it produces marked disability. It is not an uncommon sequence of gonorrhœal infection and is serious in its effects. It usually occurs during the attack of a gonorrhœal infection of the urethra or vagina, but has been observed to follow gonorrhœal conjunctivitis in children. It seems to be more common in men than in women and may not appear until late in the attack or even during the chronic stage of the infection. The severity of the symptoms frequently alternates with disappearance of the urethral discharge. One or more joints may be attacked and the inflammation at times involves articulations seldom affected by acute articular rheumatism, such as the inter-vertebral, temporo-maxillary, sterno-clavicular, etc.

Various types have been described based on clinical observations: (1) *Acute*, in which single articulation becomes suddenly affected. (2) *Chronic*, in one joint, often the knee becomes the site of a hydrarthrosis often without the usual local symptoms. (3) *Polyarthritic*, in which many joints are attacked with the appearance of more or less acute symptoms, often suppuration and complicated by cerebral or cardiac manifestations. (4) *Septicæmic*, the usual picture of this disease with the probability of cardiac complications supervening. (5) *Synovial*, in which the bursæ sheaths of tendons and even the periosteum are affected. A special form of this is the painful heel of gonorrhœa due local periostitis and subsequent exostosis.

Pathology. The morbid changes present are by no means uniform. The inflammation may involve the tissues without the joint and spread along the tendon sheaths or it may be intra-articular. In each case the synovial membranes are affected and pus may or may not be present. From the exudate the gonococcus may be grown and this organism is at times associated with the common bacteria of suppuration.

Symptoms. It will suffice to mention those of the two principal types, the acute and chronic. (a) *Acute gonorrhœal arthritis* differs in severity in different instances. It may be evidenced only by slight pain and stiffness or in the more acute infections, one or more joints may become suddenly involved in severe inflammation with pronounced pain, tenderness, redness and swelling. Intra-articular fluid may be demonstrable upon palpation. If the exudate is purulent, constitutional symptoms are usually present. In the extra-articular form the inflammation is prone to extend along the sheaths of the tendons. The symptoms are persistent and ankylosis, more or less marked, may follow. (b) *Chronic gonorrhœal arthritis*. In this condition there may be a serous joint effusion or a chronic inflammatory process may involve the intra- and extra-articular structures; in the former condition there may be little or no pain but in the latter pain is usually present and is associ-

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ated with swelling extending to some distance above and below the joint. Gonorrhœal arthritis is especially prone to affect the knees, wrists and ankles and relapses are frequent. Its course is often protracted and obstinate.

Complications are not rare and may be serious. Iritis, pericarditis, myocarditis, endocarditis, pleurisy and septic pneumonia have been observed.

Diagnosis. When there is present a urethral discharge, this is simple, but in other instances must be based upon the presence of gonococci in the blood or in the articular effusion. In the acute form the pain is more severe and the tendency to peri-articular involvement greater than in acute articular rheumatism; the latter is said to be more likely to affect several joints in succession while an arthritis of a single joint is to be considered as more probably of gonorrhœal origin.

Treatment. This consists first in the employment of local measures with the intent of curing the local genital inflammation if this is present. In general constitutional infection iodine is the most reliable agent and good results may be obtained by the administration of the syrup of hydriodic acid in doses of half an ounce (15.0) half an hour before meals in two ounces (60.0) of water. The mode and time of administration are important since the drug is somewhat irritant to the stomach. If not well borne ten percent. of resublimed iodine in oil of sesame may be employed in doses of ten to twenty minims (0.65 to 1.30) every three hours. Iodine so given is taken into the blood stream as is proven by the fact that the saliva gives the starch-iodine reaction within twenty minutes after the administration of a dose *per rectum*. The above treatment is also to be prescribed in gonorrhœal arthritis and endocarditis in connection with inunctions of colloidal silver ointment one-half an ounce (15.0) into each affected joint three times a day. Within six to ten days after the commencement of such treatment a noticeable improvement in the arthritic symptoms should be apparent.

Syrup of iron iodide in doses of ten minims (0.65) to one drachm (4.0) three times a day has also been recommended and the internal administration of the preparations of mercury has its advocates. The salicylates seem to be wholly useless.

Theoretically a gonococcus vaccine should be of decided utility. That of Cole and Meakins consists of an emulsion of gonococci in eighty-five hundredths of one percent. salt solution which has been heated for one hour at 149° F. (65° C.). The initial dose is two hundred million bacteria. The administration should be regulated by the opsonic index which should be kept as high as is possible. Better results have been met with in acute, although decided improvement has taken place in the more chronic forms.

Favorable results have been reported from the treatment of gonorrhœal arthritis by means of Bier's method of passive congestion. The technique of the treatment consists in the application of an Esmarch bandage just long enough to encircle the limb two or three times at the desired tension and

provided with strap and buckle at either end. The bandage is applied just above the affected joint and is secured when the desired degree of congestion has been obtained. The skin may be protected by a few turns of an ordinary bandage, and to avoid stasis in parts where it is not needed, that part of the limb which lies peripherally to the infected area may be snugly bandaged. The congested limb should not be allowed to become cold to the touch and the patient should not be made uncomfortable. The congestion should be continued for from ten to twelve hours at a time and, while the strap is off, the limb should be elevated to reduce the œdema which the constriction has produced. Upon the subsidence of acute symptoms, massage and passive motion should be instituted. In general the duration of the stasis should depend upon the effect obtained. If the pain is relieved in an hour or two and motion becomes less difficult, this length of time is sufficient, but if the symptoms soon return a longer application of the bandage is necessary. In the chronic effusion following acute inflammation this form of treatment is useless.

With regard to local treatment other than that by the silver inunctions, absolute rest of the affected joints is to be insisted upon, and it may be advisable to apply a splint. This, however, should not be allowed to remain in place long enough to cause ankylosis. The continued application of a ten percent. ichthyol ointment in the intervals of the silver inunctions may assist in the relief of pain.

The more chronic forms of joint involvement may be relieved by counter-irritation by blisters or the thermo-cautery, baking in the hot air apparatus is to be recommended and the absorption of the effusion may be facilitated by massage and passive movements. These last also are an excellent means of combating the tendency to ankylosis.

Constitutional treatment by means of iron, arsenic, quinine and strychnine is important, especially in the chronic infections.

Surgical treatment, consisting of opening the joint, evacuating the effusion and irrigating with mild antiseptics or sterile saline solution, has its advocates and in many instances has achieved excellent results.

SYPHILIS.

Synonyms. The Pox; Lues Venerea.

Definition. A specific constitutional disease of slow course resulting from inoculation or from hereditary transmission. The disease, when inoculated, is known as acquired syphilis and, when conferred by inheritance, as hereditary syphilis. In the acquired form there appears at the site of inoculation the so-called initial or primary lesion or chancre which is usually an ulcer possessing special characteristics. This is followed within a month or two by constitutional manifestations and lesions of the skin and mucous membranes,

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the symptoms of the secondary stage, and after months or years by gummatous growths in the various tissues and organs, the tertiary lesions, and finally there may appear various morbid conditions in the nervous system such as tabes dorsalis (locomotor ataxia) and general paresis, which are known as quaternary lesions.

Etiology. While several micro-organisms have been described, which have been thought responsible for this disease, their connection with the infection has not yet been definitely proven. In 1905 Schaudinn and Hoffmann called attention to micro-organisms of the genus *spirochæta*, which they have found in primary and secondary syphilitic lesions, both at their surfaces and in their deeper parts and in the adjacent lymphatic glands. The former observer considers that the *spirochætæ* are related rather to the protozoa than to the bacteria and must, therefore, be clearly distinguished from the spirilla. He describes two varieties, one found only in syphilitic lesions, the other, saprophytic in nature and constantly met in stagnant secretions such as those occurring about the genitals. The former is termed the *spirochæta pallida*, the other the *spirochæta refringens*. The former is much the smaller and is seen only with the higher powers of the microscope and even then with difficulty.

Metchnikoff and Roux have found identical forms in experimental syphilitic lesions in monkeys; and other observers, especially Flexner, Uhle, and MacKinney, have wholly confirmed the work of Schaudinn and Hoffmann. The *spirochæta pallida* has been found in the blood and organs of infants suffering from congenital syphilis and in acquired syphilis in the blood procured by splenic puncture on the day before the roseolar rash appeared, proving that it reaches the skin through the blood-vessels. Later it has been demonstrated in the circulating blood. In acquired syphilis it is found only during the primary and secondary stages, practically never during the tertiary. Most authorities agree that the *spirochæta* is never to be found in non-syphilitic lesions, one or two have, however, encountered it in other conditions. The balance of evidence seems to favor the ætiologic relation of the *spirochæta pallida* to syphilis, and the most conservative admit that it probably plays some part in the causation of the disease.

Syphilis is an extremely contagious disease but a solution of the continuity of skin or mucous membrane is necessary to its inoculation. The secretions of the primary and secondary lesions as well as the blood of the syphilitic patient are capable of transmitting the infection but the authorities differ as to whether the products of the tertiary manifestations, the gummata, are infectious. It is probable, however, that they are. Normal secretions, such as milk, tears, etc., unless contaminated by the secretions of specific lesions, are not capable of conferring the disease. The spermatozoa or ova of syphilitic individuals are, however, infectious.

In most instances the acquired form of the disease results from sexual

congress, either natural or otherwise, but the infection may be acquired innocently through the use of infected drinking cups or other utensils, by kissing, by the physician during operation, or while handling infected patients, by tattooing, and in various other ways. The wet nurse may be infected by the syphilitic child, the initial lesion appearing upon or near the nipple, and the disease has been transmitted by vaccination with humanized virus.

Hereditary specific disease is most commonly transmitted through the father in which case it is termed sperm infection. A syphilitic father may beget diseased offspring during the tertiary stage when all symptoms seem to have disappeared, but he is most likely to beget a syphilitic child soon after the beginning of his infection; on the other hand the child of a syphilitic father may show no evidence of the disease when begotten during the tertiary stage or even when begotten while the disease is at its height. No certain opinion can be given that a father once infected with syphilis will not transmit the disease to his children, but it may be stated that the greater the period since the occurrence of the initial lesion, the less likely are the children to be affected. At least three years, during which the individual should undergo proper treatment, should elapse between the initial lesion and marriage.

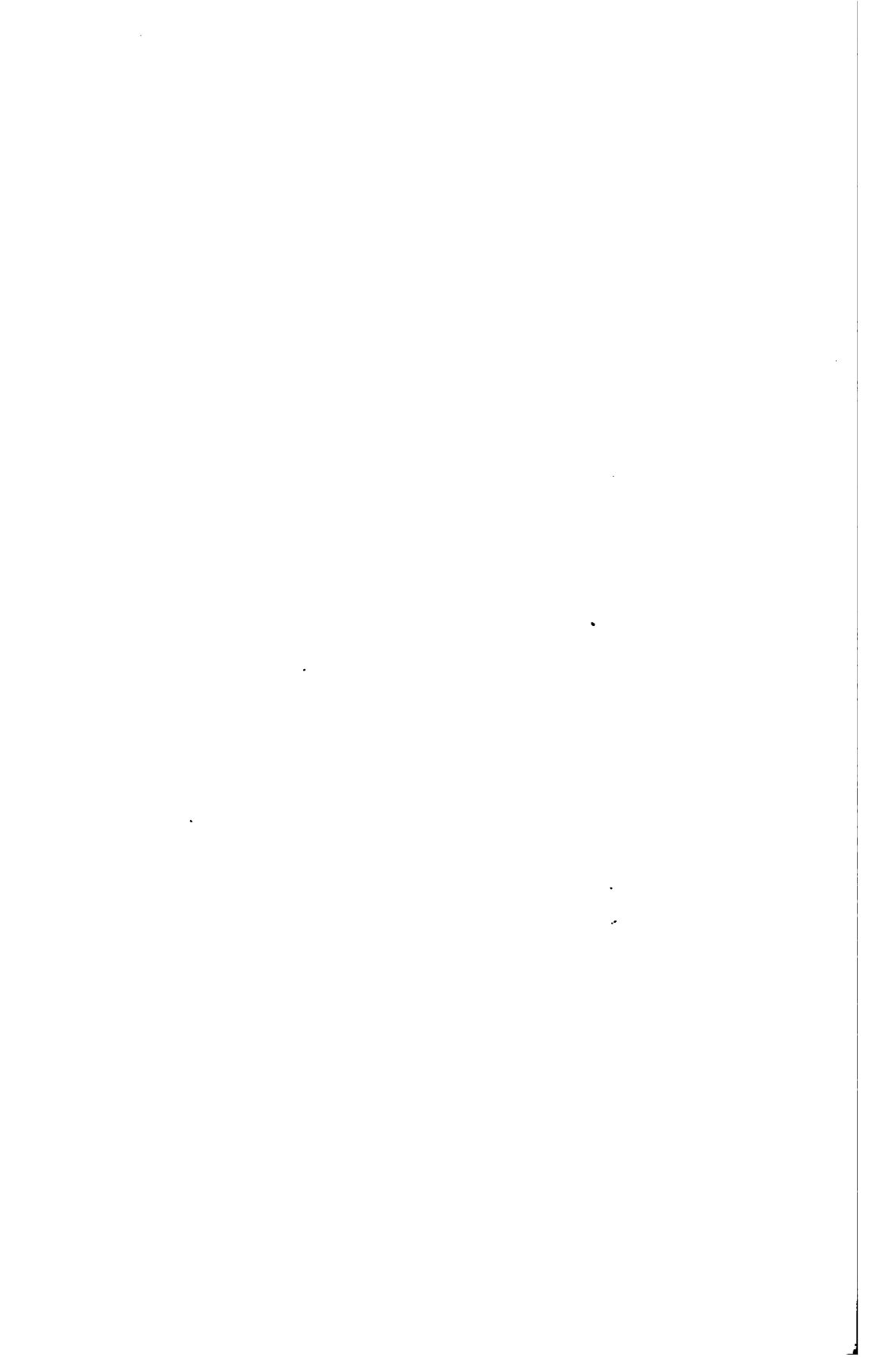
Syphilis transmitted through the mother is termed germ infection and is more likely to prove fatal than sperm infection. A child may also be infected during its passage through the parturient canal or, the mother acquiring the disease during pregnancy, the child may escape or may become infected through the placenta. It is a curious fact (Colles' law) that a syphilitic infant born of a non-syphilitic mother cannot transmit the disease to her, even though she nurse it while there exist syphilitic lesions upon its lips or within its mouth. This is probably due to an immunity possessed by the mother and which has been conferred without the manifestation of any symptoms whatever.

Children born of parents, both of whom are syphilitic, are very unlikely to escape the disease.

Acquired Syphilis.

Pathology. The lesions of this form of the infection occur in stages, the first being that of the primary lesion or chancre. This appears at the site of the inoculation and usually about three weeks after this occurrence. At first it consists of an abrasion upon which a papule or vesicle appears; later this disintegrates at its center and an ulcer results, the base and edge of which are firm and indurated, so that it is readily recognized. In women, however, this induration may not be so marked. It varies in size and may be unnoticed if it occurs within the urethra and is especially likely to be overlooked in the female. In the male it is usually upon the penis and frequently upon the prepuce, while in females a frequent site is upon the labia or upon the cervix. Microscopically the indurated tissue is found to be the result of an infiltration

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of the connective tissue with small round cells, some of which may later become epithelioid or even giant cells. The intima of the vessels is thickened and the nerve fibres may be the seat of pathological change. The neighboring lymph ganglia are enlarged, hardened and may, but generally do not, suppurate. They often form a chain in which the ganglion nearest the site of infection is more markedly enlarged.

The lesions of the secondary stage consist of a cutaneous eruption or syphilide. This rash occurs in a variety of different forms, macular, papular, pustular, squamous and tubercular; the hue of these is characteristic and may be described as ham or copper color. The macular syphilide usually lasts one or two weeks and is especially apparent upon the chest, abdomen and flexor surfaces of the arms; the papular eruption sometimes occurs upon the face as well as upon the body and, like the others, tends toward a symmetrical distribution. The pustular rash is not unlike that of variola and the squamous syphilide possesses nothing typical except its color; it is a rare form and its favorite situation is upon the extensor surfaces of the limbs. All forms of the eruption are characterized by a tendency to symmetrical distribution and to leave behind a more or less permanent discoloration.

With the cutaneous manifestations an involvement of the mucous membranes and of moist skin surfaces occurs; this is termed the mucous patch or broad condyloma (*condyloma latum*). These appear upon the buccal and pharyngeal mucous membranes and at the muco-cutaneous junctions about the lips, anus, etc., and consist of a cellular infiltration of the epidermis and corium. The mucous patch is a flat or slightly convex, pearl colored elevation, with a surface resembling mucous membrane, the secretion of which is highly contagious. The condylomata are exaggerated mucous patches and consist of rounded discs, reddish or grayish in color, granular of surface and slightly elevated. The secretion of these is also pronouncedly infectious. The venereal wart or *condyloma acuminatum* is also a manifestation of the secondary stage.

The lesions of the third stages may involve any of the deeper tissues or organs and consist of discrete tumors (gummata). These are usually firm in consistency and vary in size from that of a pin point to a diameter of from one to two inches (3 to 5 cm.). On section they are seen to consist of a central area, firm and caseous, surrounded by a layer of fibrous tissue outside which is an external layer of cellular granulation tissue.

Such gummata are common in the skin, muscles, periosteum, bone—where they are termed nodes—and in the connective tissue of the brain and viscera. When situated in submucous tissues ulceration or suppuration may result with destruction of tissue, such as is observed in syphilitic disease of the nasal or palatal bones.

Arterial changes also occur as a result of tertiary syphilis. These will be considered in the section devoted to arterial disease (*see* p. 652).

Symptoms. These occur in stages and are intimately associated with the morbid changes above described. The incubation period of the disease is usually about three weeks, that is to say about this time intervenes between the inoculation and the appearance of the primary lesion or chancre. This and the associated glandular enlargements have been considered.

The symptoms of the secondary stage usually appear in from six to twelve weeks. First there is a pharyngeal congestion with soreness of the throat. Sluggish ulcerations of a gray color are seen upon the mucous membranes of the throat and larynx, those in the latter situation being likely to cause deformity of the part upon healing. Mucous patches and condylomata may be present. There is usually a moderate febrile movement which seldom rises higher than 101° F. (38.3° C.) although temperatures of 104° to 105° F. (40° to 40.5° C.) have been observed. The temperature is usually continuous or remittent; less frequently it is intermittent and may be mistaken for malaria. The pharyngeal inflammation may involve the middle ear by extension through the Eustachian tube.

Cutaneous lesions now appear; the most frequent is the macular syphilide previously mentioned. The rash lasts for two or three weeks and may be followed by other forms of the syphilitic eruption. Recurrences of the rash may occur at intervals even as late as ten years after the initial lesion. The hair often falls and there may be a syphilitic onychia. Iritis is common and may be serious. Choroiditis and retinitis are more rarely observed. Joint symptoms, at times so marked as to suggest acute articular rheumatism, and pains in the limbs are not unusual. Jaundice, nephritis, parotitis, and epididymitis may occur. Anæmia is very common.

The tertiary stage cannot be distinctly separated from the secondary. During this stage the characteristic manifestations are various cutaneous eruptions, amyloid degenerations and involvement of the viscera by gummy tumors.

The tertiary syphilides are usually deep seated, tend to ulcerate, and may subsequently heal, leaving scars. They may be scattered over the body and are seldom symmetrical. Syphilitic rupia consists of pustules, ulcerated at the base and covered by a laminated crust.

Hereditary Syphilis.

Pathology. This may be evidenced by all the morbid changes and symptoms which are met in the acquired lues except the primary lesion. Still-births and abortions are very frequent consequences of foetal syphilis but the appearance of the newly-born syphilitic child is often that of health, the syphilitic manifestations appearing after a month or two; at other times the subject of syphilitic inheritance is poorly developed, ill-nourished, and

shriveled in aspect; skin eruptions are frequent, and the so-called *pemphigus neonatorum*, a bullous rash about the wrists and ankles, hands and feet, is typical. The liver and spleen are enlarged, the lips wrinkled, fissured and ulcerated, and the child almost invariably suffers from snuffles; the discharges are infectious and may be sero-purulent or sero-sanguinolent; bone necrosis at the bridge of the nose may lead to the characteristic deformity. Bony nodes may be present upon the skull (Parrot's sign). Middle-ear involvement may take place through the Eustachian tube. If the child is apparently healthy at birth the above described symptoms may appear up to the sixth month.

The cartilages of the ribs and those of the epiphyses of the long bones are very commonly affected and even epiphyseal separation may take place. The child nurses poorly, is restless, and a typical cry, described as harsh and high-pitched, has been observed. Hæmorrhages into the skin, from the mucous membranes or from the umbilicus (*syphilis hæmorrhagica neonatorum*), are a rather rare manifestation.

If the child survives, its growth is stunted and it is likely to present the appearance of premature age. Under proper treatment recovery may take place and, while development may be delayed, the disease may not give further symptoms. As a rule, however, further syphilitic manifestations appear at the time of second dentition or at puberty. The subject of hereditary syphilis who survives childhood is under-developed and looks younger than his age (infantilism), the frontal region is prominent, the frontal bosses protrude, the bridge of the nose is depressed (saddle-nose) and its tip turned up. Cranial asymmetry may be present and the teeth are pegged or notched (Hutchinson teeth). Those particularly affected are the upper central incisors which are peg-shaped and notched at the edges, the enamel often being wanting over the notches. Cicatrices are found in the skin about the mouth, nose, and soft palate.

Amongst other manifestations which are late in appearance are bone deformities, especially of the tibiæ which are thickened and curved antero-posteriorly, the convexity being forward; nodes may be present upon the bones; the growth of the testicles is often arrested; interstitial keratitis, iritis, otorrhœa, and syphilitic deafness and gummata of the nervous system or of the viscera may be observed.

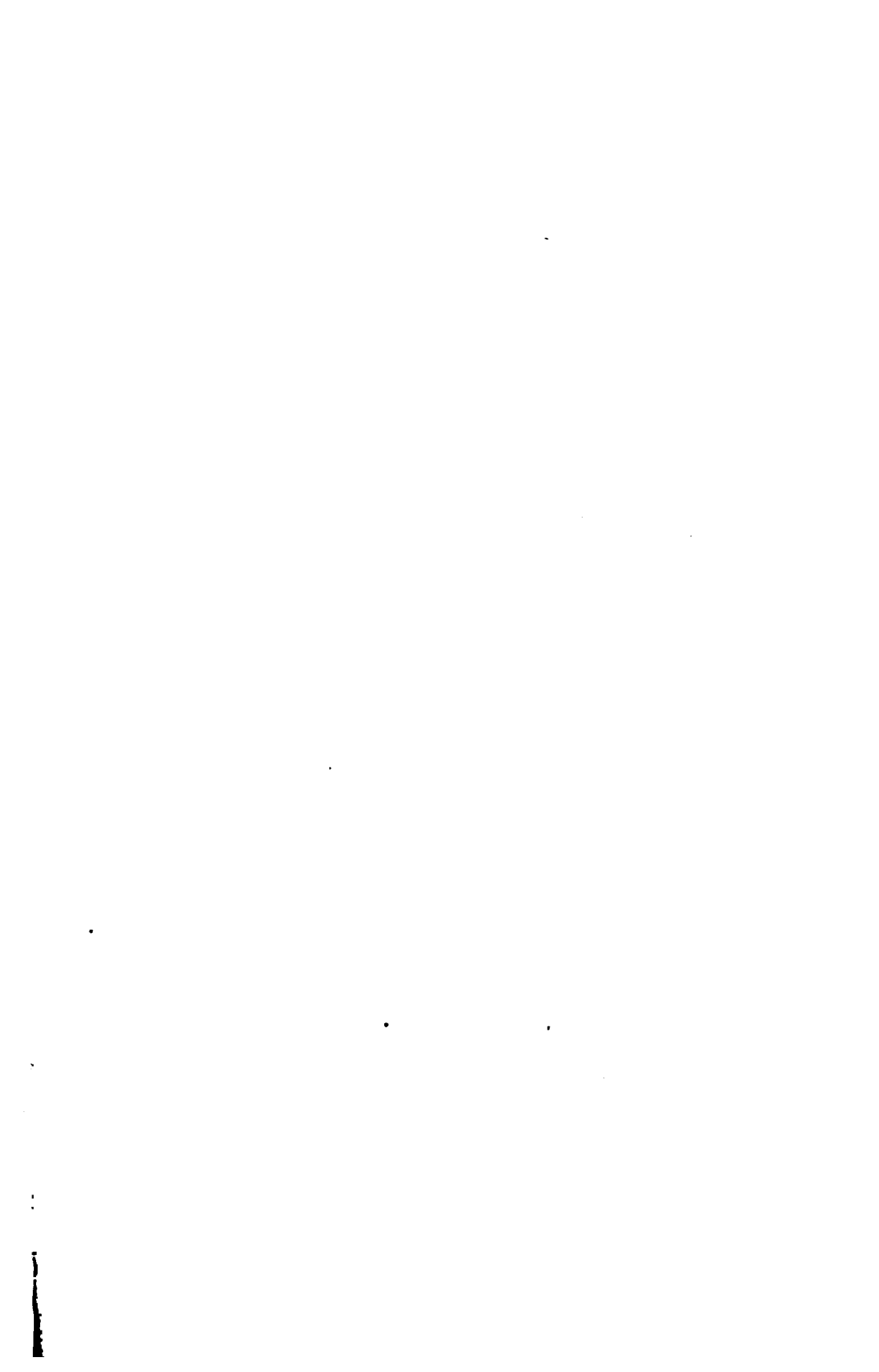
Diagnosis. This is not difficult in the presence of a history of exposure or of heredity. The symptoms of syphilis are so numerous and varied that it may simulate almost any other disease. Great care should be exercised with patients whose history is obscure. While it is always well to be guarded, syphilis is not a diagnosis to be made in lack of a better, nor is it true that a syphilitic, even having the earlier stages of this disease, is exempt from all others. There may be difficulty in deciding upon the character of the initial sore, consequently it is well to wait until the appearance of secondary

lesions before beginning treatment. The test of thorough treatment by mercury and iodine will usually clear the diagnosis in doubtful cases.

Justus' test consists in first estimating the hæmoglobin content of the blood, then ordering a mercurial inunction or injection and subsequently making a second hæmoglobin estimation. In instances of syphilis there will be a reduction of from ten to twenty per cent. This test is based upon the fact that mercury causes a destruction of the hæmoglobin which is rapidly replaced under normal conditions. In the syphilitic subject, however, this power of reproduction is greatly diminished.

The Wassermann reaction is the most recent of tests for the determination of syphilis. The principle involved is that hæmolysis does not occur in the presence of a hæmolytic amboceptor when emulsions of bacteria are mixed with an inactivated serum with the addition of a complement. The reason is that the complement binds itself with the bacteria and thus prevents the union of complement with the red cell through the medium of the amboceptor. Wassermann showed that extracts from infected organs, as well as solutions of bacterial extracts or bacterial suspensions, act in preventing the characteristic action of the antigen. The method of procedure is as follows: The antigen is a known substance, extract of syphilitic organs in sodium oleate solution or serum of syphilitic individuals to which is added (*a*) the complement, fresh normal serum of the guinea-pig; (*b*) a suspected serum heated to 132.8° F. (56° C.); (*c*) the amboceptor, the serum, of a rabbit injected intraperitoneally with calf's blood, and inactivated by heat, and (*d*) the washed red corpuscles of a sheep which furnishes the cells to be hæmolyzed. If the antigen and the serum to be tested are homologous, the complement has been bound and no hæmolysis occurs. This is called a positive reaction. Noguchi has simplified the method by using human corpuscles instead of from sheep. As antigen he employs a lipoid substance made from the liver or heart of dogs. As solutions of antigen, amboceptor and complement rapidly deteriorate, he has introduced test papers of definite size saturated with these various solutions and dried, thus bringing the method within the scope of office work. This test is positive in about eighty percent. of syphilitics. Its failure does not, however, exclude this disease. It has been recently stated that a positive Wassermann reaction may also be obtained in leprosy.

Prognosis. In acquired syphilis under early and proper treatment this is good, but the length of time necessary to assure a cure is at least two years; consequently syphilitics should be strongly advised against marriage within three years after the appearance of the initial lesion; if active symptoms remain at the end of this period marriage should be forbidden as long as these persist. Even in individuals who have undergone thorough treatment it is not unusual to observe late complications referable to the nervous system. The prognosis of infantile syphilis is not so good as that of the infection in



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Medical Record
May 13, 1911

also Medical Record
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Howard Fox & Son
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Nov. 18, 1911

of Philadelphia
K. L. Brown
Nov. 27, 1912

adults, and hereditary infantile syphilis is much more grave than that acquired after birth. Even the subjects of hereditary syphilis who survive are rendered so weak in constitution by the disease that they fall an easy prey to even slight intercurrent affections.

Treatment. The prophylaxis of syphilis acquired through illicit intercourse can only be instituted by insisting upon the absolute importance of sexual purity. The physician who advises the performance of the sexual act under illegitimate conditions cannot be too strongly condemned. The young man who finds his fleshly lusts too vigorous to be denied may do much to subjugate them by working hard physically and mentally.

Practitioners associating with syphilitics in a professional capacity cannot be too guarded in their handling of specific lesions.

Much may be done toward the prevention of hereditary syphilis by treating the mother during pregnancy if she has ever been affected with the disease or if the father is syphilitic. Syphilitic lesions of the genital tract should be cleansed and cauterized previous to labor. Should the child be born healthy it should never be nursed by a suspected mother or wet nurse, it should not be kissed by nor sleep with diseased parents, and the greatest care should be exercised in rendering utensils and other objects with which the child comes into contact above reproach. No syphilitic child should be allowed to nurse from a healthy woman.

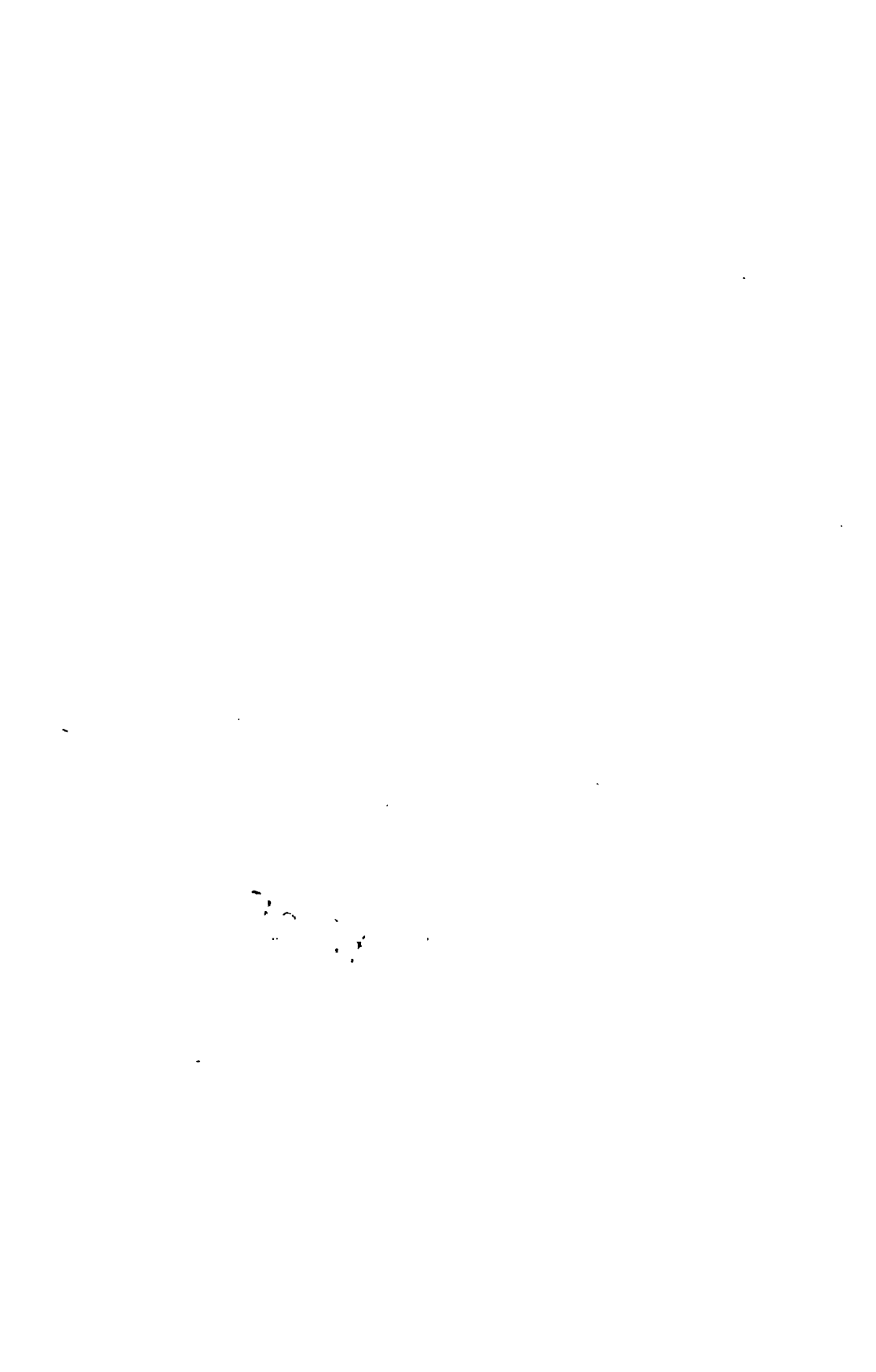
The treatment of the primary lesion consists in the endeavor to heal it as soon as possible. This is to be accomplished by simple cleanliness. The sore should be washed with a one to three thousand mercury bichloride solution several times daily and kept dusted with equal parts of bismuth and calomel, or iodoform—which should be used with care since an idiosyncrasy to this drug is not rare—or other bland antiseptic powder. A dressing of mercurial ointment may also hasten the healing process. Cauterization or excision of the lesion is useless.

The secondary lesions should also be treated by the application of cleansing agents. The teeth should be frequently brushed, and a mouth wash of a half saturated solution of potassium chlorate, which not only has a beneficial effect upon the mucous patches but is prophylactic against mercurial stomatitis, should be frequently employed. The use of tobacco and alcohol should be forbidden. Ulcers should be cleansed with the mercury bichloride solution, dressed with mercurial ointment or dusted with calomel and, if necessary, touched with silver nitrate pencil or solution; the latter may also be employed upon the mucous patches in the mouth. Condylomata should be kept thoroughly cleansed and either dusted with the powders mentioned above or dressed with mercurial ointment.

Constitutional treatment should be instituted as soon as the diagnosis is assured and consists in the administration of mercury during the secondary stage and of iodine during the tertiary. The two may often, however, be

given together with advantage during the second stage. Mercury may be administered in various ways; of these one of the best and one of the most commonly employed is by inunctions. Its disadvantages are that it takes considerable care and time and is not cleanly. The plan is as follows: The patient should take a warm bath daily to cleanse the skin and render it more capable of absorption. After the bath a drachm (4.0) of the official mercurial ointment is thoroughly rubbed into the skin, the friction to be continued until the ointment has entirely disappeared. It is well to choose a different site for the inunction each day, first taking the inside of one thigh, next that of the other, the inner aspect of the arms, then the sides of the chest, etc. When these parts have been exhausted the list should be begun again. The rubbing should last at least one-half of an hour. Hairy parts should be avoided, since the follicles offer favorable foci for the beginning of a mercurial eczema, and the use of a potassium chlorate mouth wash is necessary to prevent stomatitis. Should this occur, as evidenced by soreness of the gums and teeth, foul breath, etc., the inunctions should be stopped for a week or more until the buccal symptoms disappear. The frictions should be continued for about a month, when, if the syphilitic symptoms have subsided, they may be omitted and internal treatment begun. Here mercury may be given in various forms, the preparations most easily employed being the yellow iodide (protiodide) one-fourth of a grain (0.016), the red iodide (biniodide) one-sixth of a grain (0.01), or the bichloride one-twelfth of a grain (0.005) three times a day. If the patient can be made to understand how essential continued treatment is, the tertiary manifestations may be prevented from making their appearance. To accomplish this desirable object, however, the treatment must be often continued for an indefinite period.

Various substitutes for the inunction method of treatment have been advocated and the one most in use at present is that by hypodermatic injection of various mercury salts. The injections are given by means of a long needle attached to the ordinary hypodermatic syringe, the solution is thrown into the deeper muscular structures, and the procedure must be carried out under the most thorough antiseptic precautions. The sites usually selected are the buttock, the sides of the thorax, or the flanks. Such solutions as the following may be employed: Mercury bichloride 0.2, sodium chloride 2, distilled water to 20 parts. Of this a daily injection of fifteen minims (1.0) may be given. Mercury benzoate 0.25, sodium chloride and cocaine hydrochloride of each 0.06, distilled water to 30 parts.; peptone and ammonium chloride of each 0.3, mercury bichloride 0.2, glycerin 5, distilled water 15 parts; neutral mercury lactate 1, distilled water 100 parts; mercury cyanide 0.1, distilled water 20 parts; mercury salicylate 4, benzoinol 30 parts; of all the above the dosage is fifteen minims (1.0) which may be injected daily. In very grave infections the dosage may be doubled or fifteen minims (1.0) of a one percent. mercury cyanide solution may be introduced slowly, directly



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into a vein; a mixture of calomel and sterilized oil, one to ten, may be given subcutaneously in doses of fifteen minims (1.0) about once a week. The treatment by injections is especially indicated when it is necessary to mercurialize the patient without delay, in patients whose skin is badly affected by inunctions and the internal administration of mercury disturbs the digestion, and in instances where the disease resists other methods.

Mercurial fumigations have had a certain vogue. The patient, sitting on a chair, is surrounded to the neck by blankets arranged in the form of a tent. An alcohol lamp is placed under the chair and upon this is set a metal plate containing about half of a drachm (2.0) of powdered calomel. The *seance* should last about twenty minutes during which the calomel is volatilized by the heat of the lamp and it, with the steam from a vessel of water also placed over the lamp, is absorbed by the patient's skin. This treatment affects favorably both the constitutional symptoms and the eruption. Calomel vapor when inhaled, the mouth being held about twenty inches from the containing vessel, often exerts a favorable influence upon the mucous patches. After the inhalation the mouth should be thoroughly washed to prevent salivation.

Hutchinson prefers to give mercury with chalk (*hydrargyrum cum creta*) in pill form, each pill containing one grain (0.065) each of this preparation and Dover's powder; one pill to be taken from four to six times a day. Most excellent results are said to be obtainable from this form of treatment.

While undergoing mercurial treatment the patient should be forbidden to eat fruit and green vegetables.

Instances are often met in which greater benefit is achieved by the alternate administration of mercury and iodine or by giving these drugs in combination, the so-called "mixed treatment." Those in which this form of treatment is particularly indicated are the cases with dry tubercular syphilides, cases with the syphilitic rupia, those with choroiditis, onychia, periostitis, and cerebral syphilis. The following formula will be found useful: *R. Hydrargyri iodidi rubri, gra. iiii (0.2); potassii iodidi, ℥iiss (10.0); syrupi, q. s. ad, ℥iv (120.0). Miscē et signa; One teaspoonful two or three times daily.*

The potassium iodide in this formula may be increased as indicated. Another useful prescription is composed of mercury bichloride two grains (0.13), potassium iodide three to five drachms (12.0 to 20.0) and distilled water and compound syrup of sarsaparilla equal parts up to four ounces (120.0), of which the dose is a teaspoonful (4.0). Here the combination of potassium iodide with mercury bichloride results in the production of a certain amount of red mercuric iodide which is dissolved in the excess of potassium iodide. The mixed form of treatment has been considered especially effective in the intermediate period of the disease when the secondary stage is passing into the tertiary. It is also indicated in instances of syphilitic

hepatitis and in the presence of the ascites of this condition the so-called Guy's diuretic pill which is composed of one grain (0.65) each of powdered digitalis, squill and calomel may be prescribed with benefit.

In the third stage of syphilis iodine, administered in the form of iodides and particularly potassium iodide, produces results which cannot be accomplished by any other means, the rapid absorption of nodes, gummata, and other deposits quite frequently being brought about. In order to secure the best effect it is necessary to give very large amounts in many instances, two to four drachms (8.0 to 16.0) and even more being not an unusually large daily dosage. In syphilis of the nervous system especially large doses are called for and daily amounts of one ounce (30.0) are not infrequently required. The drug may be administered in saturated aqueous solution, in milk or in the compound syrup of sarsaparilla beginning with ten drops (0.65) three times a day and increasing the doses one drop (0.065) daily until the disease is controlled. Should the symptoms of iodism appear—nasal discharge, an erythematous eruption, increased secretion of saliva and swelling of the salivary glands causing a sense of tightness in the throat—the drug should be stopped or the dose diminished until these disappear. It has been advised to enlarge the beginning dose to thirty to forty minims (2.0 to 2.65), since, when given in this way, the drug has seemed less likely to cause toxic symptoms. Another most excellent method of giving iodine is in the form of the syrup of hydriodic acid. The dosage of this preparation is from one to four drachms (4.0 to 16.0) three times a day one-half an hour before meals and diluted with a wine glass of water. Iodine itself may be administered in capsules each containing from ten to twenty drops (0.65 to 1.30) of a ten per cent. solution of resublimed iodine in oil of sesame. Strontium and sodium iodide have been suggested as substitutes for the potassium salt since they, especially the former, are pleasanter to take, are less likely to disturb the stomach and to cause toxic symptoms. It is said that the iodide should be suspended during menstruation if there is any tendency to menorrhagia.

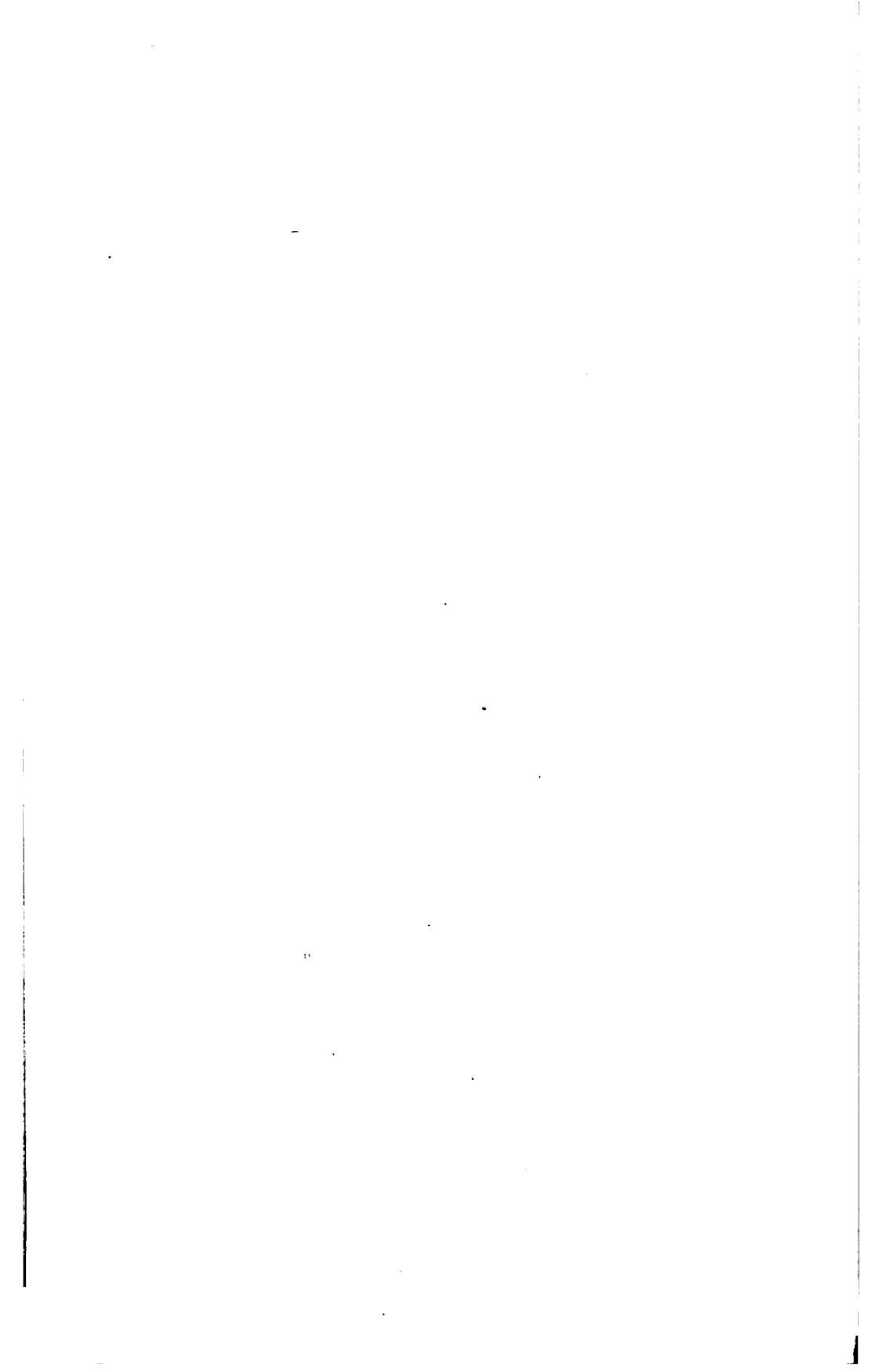
During a course of antisyphilitic treatment the patient should be advised to regulate his mode of life in accordance with strict hygienic principles; fresh air, moderate exercise, and nutritious diet are essentials. The eliminatory functions should be kept properly active, and co-existent disease, especially tuberculosis or anæmia, should receive appropriate tonic treatment.

The treatment of syphilis at mineral—especially sulphur—springs has no advantage over a thoroughly carried out home treatment. At such places it is perhaps easier for the patient to lead a regular and healthful life, and the frequent employment of baths may render the skin more receptive to inunctions of mercury.

The treatment of special organs the site of syphilitic manifestations will be considered with their other diseases.

The treatment of hereditary syphilis should be instituted as soon as the

Substitute
blue mass for
calomel



symptoms of the disease appear or even sooner if the parents give distinct evidence of the disease. Mercury and potassium iodide are as potent here as in adults and may be administered in the same way. Usually the inunction method is preferable. The technique of the treatment has been already described and about twenty grains (1.30) of a mixture of equal parts of mercurial ointment and lanolin or vaseline are employed at each friction. For a child of two years thirty grains (2.0) may be used, and at three years of age the dose may be increased to forty grains (2.65). The inunctions should be continued for three weeks, suspended for a week or ten days and then repeated. The internal administration of mercury should then be begun. Either mercury with chalk one grain (0.065) or mercury bichloride one-sixtieth of a grain (0.001) four times a day may be given unless it is desirable to mercurialize the patient as quickly as possible when one-tenth of a grain (0.006) of calomel should be given three or four times daily. Mercury should be continued for a year, with occasional intermissions of a week or more, at the end of which period mixed treatment may be prescribed. Here we may give a mixture consisting of mercury biniodide 0.1, potassium iodide 5, simple syrup, 250 parts; this may be given in milk in the following doses. To a child of from one to three years, fifteen to thirty minims (1.0 to 2.0); three to five years, one drachm (4.0); six to ten years, two drachms (8.0). The treatment by hypodermatic injections may be employed in instances of digestive disturbance and where the mercurial frictions irritate the skin.

In tertiary infantile syphilis with gummata, visceral, osseous, and other lesions, potassium iodide should be prescribed in sufficient dose to meet the indication. The daily dosage for a child of from one to fifteen months is from three-fourths to three grains (0.048 to 0.2); from fifteen months to three years, three to six grains (0.2 to 0.4); from three to five years, seven to fifteen grains (0.5 to 1.0); and from five to ten years, fifteen to forty-five grains (1.0 to 3.0). The drug should be given well diluted with milk, and if it is not well borne the substitutes suggested on the previous page may be employed. Anti-syphilitic treatment should be continued as long as luetic manifestations are present.

The local treatment of infantile syphilis is identical with that of the disease in adults and it is often of great advantage, particularly if the child's nutrition is poor and anæmia is present, to either intermit the specific treatment for a time or to diminish the dosage, in the meantime giving various tonics, particularly iron, codliver oil, and the bitters.

Attempts have been made to elaborate a serum for the treatment of syphilis, but up to the present time little or no success has attended these efforts.

TUBERCULOSIS.

Definition. Tuberculosis is an infectious disease characterized by general or local inflammatory processes resulting from the presence and growth within the organism of the tubercle bacillus. The typical lesions consist of nodules or diffuse tissue infiltrations which gradually become caseous, sclerosed, ulcerated or, more rarely, undergo calcification.

Ætiology. While tuberculosis was considered a disease of infectious character previous to the demonstration of the *bacillus tuberculosis* by Koch in 1882, it remained for this observer to prove beyond question its specific origin. The bacillus is found in tuberculous lesions and discharges and in the dust of apartments occupied by affected patients as a result of the drying of improperly cared for sputum. It is also found in the meat and milk of diseased animals, those most frequently harboring the infection being the bovines; it is rare in sheep and horses but pigs in certain districts are prone to suffer. Tuberculosis is very likely to attack apes in captivity but is unknown amongst them in the wild state.

The bacillus effects entrance into the body in most instances upon the inspired air which may be contaminated by dried sputum or may contain the moist particles which are emitted by tuberculous individuals in coughing, sneezing, and even during conversation. These fine bits of spray have been proven to contain the bacilli. These facts account for the frequency with which those closely associated with subjects of the disease, such as nurses, members of the family, etc., contract the disease, although there is no doubt that by careful attention to cleanliness and proper hygiene this danger can be almost entirely averted.

The contagium may also be taken into the alimentary tract with the food, instances having been traced to the milk, meat, and even the butter from infected animals. Food may become contaminated by proximity to tuberculous cooks, bakers, etc., and the milk from a diseased mother may infect her infant, accounting for the occurrence of tuberculosis of the digestive tract in children. Tuberculosis is common in cattle; and, although there are certain differences between animal and bovine tuberculosis, it is probable that the human bacillus infects cattle with difficulty while the bovine bacillus infects animals, and probably also man, with great readiness. The bovine bacillus is believed to possess the greater virulence.

Contact with the excreta of the tuberculous, with the meat of diseased animals, with the lesions of bodies dead from the infection, etc., may cause tuberculosis by inoculation. To the acquirement of the disease in this way the contact of the infectious matter with an abrasion of the skin or mucous membrane is necessary.

With regard to the hereditary transmission of tuberculosis it may be said that the disease has been noted in rare instances in the foetus and that infants

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have been born with tuberculous lesions; this circumstance also has been observed but seldom. It is a fact that the children of tuberculous parents are more prone to the acquirement of the disease and possess poorer powers of resistance than do those of more healthy heredity.

Other predisposing causes are:

(a) *Race.* The disease is met in all races, the negro and the American Indian, living under civilized conditions, being especially prone to the affection. Hebrews seem to a certain degree exempt, perhaps owing to the peculiar supervision exercised over the meat consumed by them.

(b) *Age.* Tuberculosis may occur at any time of life but certain types seem more common at certain ages than at others, thus pulmonary tuberculosis is most frequent between twenty and thirty while children are particularly prone to the glandular, meningeal, and mesenteric forms.

(c) *Sex.* Females appear to be slightly more susceptible than males, perhaps because their duties confine them to the house more than do those of the opposite sex. The progress of the disease becomes more rapid during pregnancy and lactation.

(d) *Climate.* Regions which are subject to dampness and sudden changes of temperature are most favorable to the development of tuberculosis, possibly because under such conditions catarrhal affections are common, these diminishing the resisting power of the body and offering an acceptable nidus for lodgment of the contagium. The disease, however, does occur in all climates.

(e) *Sanitation.* Unhealthful surroundings, overcrowding, lack of fresh air and of proper food, and unhygienic occupations, such as those which entail the inspiration of dust-laden atmosphere, are distinct predisposing factors.

Further, any acute or chronic disease, particularly catarrhal affections of the respiratory tract, influences which bring about a diminished pulmonary blood supply, congenital or acquired narrowing of the pulmonary artery and other circulatory diseases, predispose to the occurrence of tuberculous affections. Traumatism of the thorax, although there may be no injury to the lung itself, also may be followed by pulmonary tuberculosis. Enteric fever is followed by pulmonary tuberculosis in a small proportion of cases. Influenza, measles, pneumonia, whooping cough, and diabetes mellitus are credited with creating a predisposition to this disease.

Pathology. The characteristic morbid change is the occurrence in various tissues and organs of miliary tubercles. The most frequent sites for their development are the lungs, liver, and spleen; they are also found in the meninges, the bone-marrow, the peritonæum, the heart muscle, and the choroid. The tubercles vary from microscopic size to that of a pea, and histologically are made up of a number (from ten to fifty) of smaller tubercles. The fact that many of them resemble in size and form a millet seed has led to

the term miliary. The tubercle is formed as follows: The bacilli having lodged in a certain tissue act as an irritant, as a result of which there is an emigration of leukocytes from the neighboring blood-vessels; these, with the epithelioid and giant cells, which are produced by proliferation from the cells of the adjacent structures, and with a supporting frame-work of connective tissue, which is most abundant near the periphery, make up the miliary nodule. The bacilli occur within the substance of the epithelioid cells and the giant cells, and the fact has been noted that where the latter are most plentiful the bacilli are fewest; accordingly, in lupus, tuberculous joint lesions and adenitis, the giant cells are many and the bacilli few, while in pulmonary lesions the opposite condition obtains.

The tubercle also occurs in solitary form; here it is not composed of an aggregation of small miliary bodies but is a single cheesy mass of size varying from that of a pea to that of the fist. It consists principally of round cells in which the bacilli are found; these are supported by a fibrous reticulum, and the latter may exist in such amount as to render the entire nodule fibrous in consistency. These single tubercles are found in different situations such as the spinal cord, the liver, the heart, the spleen, and especially in the brain in children, and are subject to caseous, suppurative, or calcareous degeneration.

The Degenerations of Tubercle. Of these the most common is caseation. This begins at the center of the tubercle and is a process of coagulation necrosis of its cells; these gradually lose their outline, their nuclei become indistinct and are no longer demonstrable by staining, and finally a structureless granular mass results. The bacilli persist and the cheesy substance resulting may undergo softening, calcification, or may become encapsulated by a fibrous wall. The first of these processes is the most frequent and the caseous mass degenerates into a puriform substance which is not pus, strictly speaking, but which consists of fat droplets, granular matter and disintegrated cells, and contains tubercle bacilli in abundance.

Calcification is less common; here a form of healing takes place by infiltration of the tubercle with calcium salts. Tuberculous deposits in the lymph glands are particularly likely to undergo this change and, exceptionally, it may occur in the lungs.

The sclerotic change in which the tubercle is converted into fibrous tissue consists of a metamorphosis, which, as the disintegration at the center of the nodule takes place, is characterized by hyaline degeneration and increase of fibroid tissue, a firm hard mass resulting; this is a healing process and depends upon the body's power of resistance to the growth and development of the bacilli. It is frequently observed in peritonæal tuberculosis and at times is seen in the lungs.

Secondary inflammatory processes are changes, set up, not in the tubercle itself, but in adjacent tissues by the development of this structure; for instance, an overgrowth of connective tissue may result, causing a fibroid

caps

^ (see p. 791)

phthisis or a catarrhal pneumonia. Suppuration is a frequent associate of tuberculous pulmonary inflammation but is the result of a mixed infection with pyogenic bacteria. Whether the tubercle bacillus is capable alone of producing pus is a disputed question. Certainly the fluid contents of a cold abscess is not true pus and does not contain the bacteria of suppuration. On the other hand, in tuberculous inflammations of bones and joints, pus is often observed; this, however, may be the result of mixed infection just as is the purulent sputum of pulmonary tuberculosis.

Acute Miliary Tuberculosis.

Synonym. Diffuse General Tuberculosis.

Definition. An acute disease characterized by the presence of numbers of tubercle bacilli in the blood which find lodgment in various parts of the body and there cause the development of miliary tubercles. The disease is, as a rule, secondary to the softening of a tuberculous nodule, usually in the lungs or a lymph gland, and is the result of the dissemination of the bacilli by means of the blood or lymph circulation. The rupture of the nodule may be directly into a blood-vessel, an example of a veritable embolic process.

This form of tuberculosis is most common in adolescents and young adults.

Pathology. In considering acute miliary tuberculosis from its pathologic aspect it is not to be forgotten that it is the result of an old tuberculous lesion. The tubercles which are disseminated through the various tissues in this form of tuberculosis have already been described (*see* p. 165).

Acute tuberculosis occurs in three principal types: 1. With symptoms pointing to general infection. 2. General infection with pronounced pulmonary symptoms. 3. General infection with marked symptoms referable to the central nervous system which will be considered with the diseases of that system.

1. Acute General Miliary Tuberculosis.

Symptoms. These are those of a severe general infection without marked local manifestations and there is great possibility of mistaking the disease for enteric fever. Prodromata, consisting of indefinite malaise, loss of appetite, etc., are common, but an abrupt onset with fever may occur; afebrile instances of the disease have occasionally been observed. The pulse is rapid, the tongue dry and cerebral symptoms analogous to those of enteric fever are common. The temperature is usually lower in the morning (101° F.)—(38.3° C.) and higher at night (103° to 105° F.)—(39.4° to 40.5° C.), although an occasional reversal of this type of temperature may occur; this is considered an important point in the differentiation of the disease, as is also the

fact that the temperature curve, taken as a whole, is more irregular than that of enteric fever and does not present the progressive rise of that affection. Bronchitis may be present but may not be more pronounced than that occurring in typhoid infection. Profuse sweating is common and herpes may be observed; splenic enlargement may be noted, and spots resembling those of typhoid fever have been described. The latter, however, do not appear in successive crops.

Early in the disease there are seldom physical signs referable to the lungs other than those of a slight bronchitis, later the respiration may be accelerated and slight cyanosis may occur. As the disease progresses pulmonary and meningeal manifestations may appear. There may also be signs and symptoms of pleuritic, pericardial or peritonæal involvement. Tuberculosis of the choroid may also be noted.

Diagnosis. This is often difficult, the disease being especially likely to be confounded with enteric fever from which it may be differentiated by its temperature curve, its duration, which is more protracted, the splenic enlargement which appears later and is less pronounced, and by the lack of rose spots. Cyanosis and accelerated respiration are more frequent in tuberculosis.

In neither disease are the leukocytes increased in number, but upon the incidence of mixed infection, which sooner or later may manifest itself in tuberculous infection, a leukocytosis appears. The examination of the sputum rarely reveals the presence of tubercle bacilli unless the pulmonary nodules disintegrate and escape through the bronchial mucous membrane; they are, however, to be found in the blood, especially that withdrawn from the spleen. When not directly demonstrable, culture and inoculation experiments may reveal their presence.

The absence of the Widal reaction is a valuable point in differentiation.

The urine may contain albumin, usually not as a result of tuberculous involvement of the kidney, but of the febrile process. Unfortunately the Ehrlich diazo-reaction is often present in acute tuberculosis as well as in enteric fever.

The cerebrospinal fluid, withdrawn by lumbar puncture, may contain tubercle bacilli even though meningeal inflammation is not a feature of the patient in hand.

Prognosis. In this, as well as in other forms of acute tuberculosis, it is distinctly unfavorable, a fatal outcome being almost inevitable. The course of the infection is usually from four to eight weeks or more, although more rapidly fatal instances have been observed.

Treatment. This is wholly symptomatic and consists in the administration of proper nourishing food in sufficient quantity, of stimulants as indicated, of antipyretics, such as antipyrine or acetphenetidin—five grains (0.30) repeated as necessary—of sedatives, such as the bromides, to quiet the nervous

See albumin
reaction in the
tissue of pulmonary

Tubercles

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symptoms and of such drugs as heroine or codeine to allay the cough. The skin, kidneys and bowels should be kept properly active by means of the usual measures.

2. Acute General Tuberculosis of Pulmonary Form.

Symptoms. This type of the disease occurs in adults who have been the subjects of chronic bronchitis or of chronic tuberculosis and is often observed in children after measles or whooping cough. The symptoms are those of a marked acute bronchitis; with the cough there is muco-purulent expectoration; hæmoptysis is rare. Dyspnœa and cyanosis are pronounced; the pulse is rapid and feeble, the temperature irregular, rising at night to 102° to 103° F. (38.9° to 39.4° C.) or, perhaps, elevated in the morning and low in the evening. The spleen is increased in size in infections of acute course. The outcome is invariably fatal, death occurring at times within two weeks. In other instances the disease may progress for several months.

The physical signs are those of bronchitis (sibilant and sonorous râles), or there may be areas of diminished resonance with bronchial or broncho-vesicular breathing and fine crepitant râles due to scattered foci of broncho-pneumonia. Areas over which the note is hyper-resonant, as a result of localized emphysema, may be evident. As the disease progresses the râles become louder and more moist. Tuberculous involvement of the pleura gives rise to friction râles.

Diagnosis. This is to be made upon the points already set down on page 167. The presence of marked dyspnœa and cyanosis with the signs of bronchitis is always suspicious. The choroid should be inspected for the presence of tubercles and the sputum examined for the bacilli, which are by no means always present. A history of enlargement of lymphatic glands or of measles or pertussis will often aid in the diagnosis.

Treatment. This is likely to prove useless, but the patient should be made as comfortable as possible and the symptoms should be relieved as they arise; otherwise the treatment is identical with that of chronic pulmonary tuberculosis.

3. Acute General Tuberculosis of Meningeal Form.

See Tuberculous Meningitis, page 791.

PULMONARY TUBERCULOSIS.

A Acute Pneumonic Pulmonary Tuberculosis.

Synonyms. Phthisis Florida; Galloping Consumption.

This type of pulmonary tuberculosis occurs in two forms, the pneumonic and the broncho-pneumonic. In the former one lobe or an entire lung may be affected and its condition resembles that found in an infectious pneumonia,

and later is filled with cheesy matter composed of aggregations of tubercles, which, if the disease lasts long enough, soften, and cavity formation, especially at the apices, takes place. The pleura is the seat of an exudative inflammation and the peritonæum and bronchial glands are also likely to be involved. In the broncho-pneumonic type the consolidation takes place in scattered areas, as a result of which there are disseminated foci of whitish, cheesy matter which are separated from one another by congested pulmonary tissue. These foci tend to soften and become small abscesses. The bronchial lymph glands are usually the seat of tuberculous inflammation.

Symptoms. *The pneumonic type* is more common in adults. Its onset is marked by a chill followed by rise in temperature, cough with mucoid, often blood stained, sputum, pain in the side, and dyspnœa. The affection is often mistaken for an acute infectious pneumonia which it resembles markedly in its early symptoms and physical signs, which are those of pulmonary consolidation occurring in one or more lobes. Resolution, however, does not take place, but as the consolidation softens, the physical signs of a cavity become manifest and microscopic examination of the sputum reveals tubercle bacilli. The course of this type of the disease is usually from one to three months, when death may take place or the process may become a chronic pulmonary tuberculosis. A more rapid course is rare.

The broncho-pneumonic type is most often met in children in whom it is prone to follow measles or pertussis. The child is affected with a chronic bronchitis with fever, cough and dyspnœa; the signs are those of bronchitis, moist and subcrepitant râles being abundant, and small areas of consolidation, evidenced by a high pitched percussion note, broncho-vesicular voice and breathing may be demonstrated. Emaciation is rapid, the temperature becomes of hectic type and, as the areas of consolidation soften, tubercle bacilli appear in the sputum. The prognosis is bad, death usually ensuing within one to two months; more rare are the patients in whom the disease is rapidly fatal and those who go on to chronic pulmonary tuberculosis.

Treatment. During the acute stage, this consists in maintaining the patient's nutrition and combating the symptoms as they arise. That of the chronic stage will be considered later under the treatment of chronic pulmonary tuberculosis.

^Chronic Pulmonary Tuberculosis.

1. *Chronic Ulcerative Phthisis.*

This is the most common form of pulmonary tuberculosis and begins with the formation of miliary tubercles in various parts of the lung, usually, however, in the apices. At its inception it is a purely tuberculous disease and so remains until the softening and breaking down of the tubercles, when the resulting ulcerating surfaces become infected with the bacteria of suppuration and a so-called "mixed infection" results.

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Pathology. The morbid changes present in the lung of chronic ulcerative phthisis are many and varied. The disease spreads from the initial point of infection which is usually a little below the apex of one or the other lung and often nearer the posterior than the anterior aspect. Consequently the situation at which physical signs are first perceptible is either on the anterior surface of the chest just below the middle of the clavicle or posteriorly in the supraspinous fossa. From this spot the process spreads downward, affecting the outer portion of the upper lobe rather than the inner. Later the apex of the other lung becomes involved, but usually not before the disease has affected the upper part of the lower lobe of the lung first attacked. Primary involvement of the bases of the lungs is rare.

The lesions found in the tuberculous lung are by no means constant nor do all the conditions to be described necessarily obtain in every patient. The morbid changes which may occur are as follows:

(a) *Miliary Tubercles.* These vary in situation depending upon whether the infection was the result of inhalation or of dissemination of the bacilli by the lymph circulation. In the former instance they are found in the walls of the smaller bronchi or air spaces, in the latter they occur about the primary foci of the inflammation. They also may be seen in the walls of the small blood vessels.

(b) *Tuberculous Broncho-Pneumonia.* Here we find areas of caseation due to the accumulation in and around the small bronchi of inflammatory products. These foci tend to coalesce and, if rapid degeneration and softening takes place, break down and result in the formation of small cavities. If the process is more chronic, fibrous tissue may develop about the cheesy mass finally encapsulating it. The substance within this fibrous capsule may either remain soft and caseous, with areas of calcareous degeneration, or become entirely sclerotic.

(c) *Tuberculous Pneumonia.* This is a condition characterized by an exudative inflammation involving the tissues surrounding the tubercles. The adjacent alveoli are filled with epithelioid cells. Such areas of consolidation on cut section resemble the red hepatization of lobar pneumonia or yellowish or whitish spots may be observed due to the presence of foci of fatty degeneration.

(d) *Cavities,* the result of the breaking down of the tuberculous areas, are a characteristic anatomical feature. The wall of the bronchus is weakened by the tuberculous inflammation and ulceration, is strained by the effort of coughing, yields, and finally gives way forming a cavity at first small but later of larger size, since adjacent cavities tend to unite until an entire lobe may be involved in the process. Fresh cavities possess caseous and necrotic walls, while those of long standing are lined with smooth walls of granulation tissue which produce pus. Into such cavities blood-vessels of considerable size may protrude which may either be the seat of an obliterating endarteritis

or of aneurysmal dilatations. Such vessels, if not entirely occluded by the arteritis, when eroded by the inflammatory process, cause hæmorrhage. The cavity contains the pus produced by its lining, tubercle bacilli, and other micro-organisms. Rarely these cavities may contain calculi, the result of incrustation of stagnant muco-purulent secretions formerly known as the calcareous phthisis of Bayle. The lung about the cavity may be consolidated. Small cavities often have ragged and necrotic walls which continually are breaking down. Cavities may also result from the softening at the center of a caseous mass or be bronchiectatic in character. Rupture of a cavity into the pleura with consequent pneumo- or pyopneumo-thorax, may take place.

(e) *Pleurisy* accompanies chronic phthisis in the great majority of instances; it may be either simple or tuberculous, in the latter case miliary tubercles or cheesy deposits are present. There may be thickening of the pleura with adhesions, serous, hæmorrhagic or purulent exudations, or a condition of pyopneumo-thorax.

(f) *The bronchial lymph nodes* usually participate in the infection. In the infections of rapid onset and course they are enlarged and softened and contain cheesy areas and miliary tubercles; in instances of more protracted evolution, caseous foci, calcareous degeneration or suppuration may be observed.

(g) *Lesions of Other Organs.* The larynx is frequently involved even to the extent of destruction of the epiglottis and vocal cords. The cervical and retro-peritonæal glands may be seat of tuberculous inflammation and miliary tubercles may be found in the intestine, the spleen, the kidneys, the brain, the liver, and the pericardium. Tuberculous endocarditis may be observed. Especially in the protracted infections we may find amyloid and fatty degenerations of the viscera. The former occurs in the liver, kidneys, spleen, and intestinal lining while the latter is more prone to affect the liver and kidneys.

Symptoms. The invasion of this disease is most insidious and consequently is frequently overlooked. The various modes of onset may be classified as follows:

(a) With successive attacks of bronchitis, each more obstinate than its predecessor. The patient takes cold easily and finally is attacked by a bronchitis that refuses to respond to treatment. The cough becomes frequent and distressing, and examination reveals the presence of physical signs.

(b) With symptoms referable to the stomach. This is by no means a rare mode of invasion but is often overlooked and the patient goes to the gastrologist who exerts himself in the direction of his specialty while the patient loses much valuable time. Such patients complain of no symptoms pointing toward the lung but suffer from gastric irritability, eructations, vomiting, and perhaps hyperacidity. An accompanying anæmia, with palpitation, loss of



strength, evening rise of temperature and irregular menstruation, is very frequent in young women. Too much stress cannot be laid upon the great importance of a thorough physical examination of the lungs in patients presenting such symptoms.

(c) The onset may take place without exciting the suspicion of the patient of the fact that he is ill, or the pulmonary symptoms may be masked by manifestations due to affections of other tissues, such as the peritonæum, intestinal tract, or the bones. The lungs of such patients, very much to their surprise, may be found to be the seat of advanced tuberculous disease.

(d) An onset with regularly recurring chills, fever and sweating may occur in which the manifestations strongly suggest malarial infection.

(e) Pleurisy, either fibrinous or with the exudation of serum, may mark the invasion of the tuberculous process, signs of the latter appearing after the former conditions have been present for longer or shorter intervals.

Certain German observers have considered all instances of serous pleurisy to be of tuberculous origin but this is quite too sweeping an hypothesis. Those from which blood-tinged fluid is drawn are frequently the result of infection with the bacillus of Koch. Bowditch has reported ninety instances of serous pleurisy which eventuated in pulmonary phthisis.

(f) Hæmorrhage from the lungs appears as an initial symptom in a certain number of patients but in these careful questioning may elicit a history of chronic cough or hereditary tuberculous predisposition, showing that pulmonary involvement has pre-existed.

(g) Laryngeal symptoms, especially hoarseness, as initial manifestations would seem to argue tuberculous infection of the larynx as a primary lesion to which those of the lungs are secondary. This is very rare.

(h) Pulmonary tuberculosis may be preceded by enlargement of the glands of the neck or axilla and examination often will reveal involvement of the lung of the same side.

Of the symptoms of chronic phthisis cough is one of the most generally present. At first it is slight, and while it may remain so, as the disease progresses, it usually increases in severity. It is the result of the irritation caused by the bronchitic or pneumonic process or is due to the accumulation of matter in the tuberculous cavities. These when filled are often cleared by successive fits of coughing. Under such conditions paroxysms of coughing occur at intervals. The expectoration varies with the extent of the pulmonary involvement. At first it is scanty and mucoid, and does not contain the bacilli; this is during the so-called pre-bacillary stage, the latter being a misnomer since the bacilli are present within the pulmonary tissues although they do not occur in the bronchial exudate. After ulceration or the rupture of the tuberculous nodules, bacilli are present and, as mixed infection usually takes place at this time, the sputum also contains pus. Blood also may now be present owing to the involvement of blood-vessels by the process of ulcera-

tion or the breaking down of the tubercles. In quantity the sputum varies from one-half an ounce (15.0) to eight ounces (250.0) during twenty-four hours. It is seldom foetid, usually possessing a faint sweetish odor. The expectorations often take a circular form which is termed nummular from supposed resemblance to a coin. Hæmoptysis occurs in from sixty to eighty percent. of patients and is a result of the rupture of vessels whose walls have become weakened by the tuberculous infiltration or of the erosion of vessel walls by inflammatory process. Early in the disease the quantity of blood is small, but in the later stages it may be so large as to result in death. Another danger of hæmoptysis is that bits of clot may be drawn deeper into the lungs by respiration, and, acting as irritants, cause inhalation pneumonia. Small hæmoptyses early in the disease may occur as a result of the inflammation of the bronchial mucous membrane and should lead to a careful investigation.

Microscopically the sputum of phthisis may contain mucus, epithelial cells from the respiratory tract or mouth, bits of food, Charcot-Leyden crystals, red blood cells and, after the lung tissue has begun to break down and mixed infection has taken place, pus cells, tubercle bacilli, and elastic tissue.

The cough, especially late in the disease, often incites emesis, probably due to the irritation of the pharynx caused in the act of coughing.

Pain is not a typical symptom of the disease but may be caused by excessive coughing, in which case it is usually in the lower part of the chest, or by the pleurisy; here it is sharp and stabbing in character and located at the site of the pleural inflammation, although at times it may be referred to the other side of the thorax.

Fever is a very constant symptom. Early in the infection it is the result of the tuberculous process within the lungs and is usually slight and of continued type with, perhaps, slight evening exacerbations. With the breaking down of the tuberculous tissue in the lungs and the incidence of mixed infection, to which latter it is due, the so-called hectic temperature occurs. This is septic both in origin and character, usually reaching its highest point during the afternoon or evening and its minimum during early morning hours. Certain patients may exhibit no distinct febrile movement during their entire course, although these probably have had fever at the onset of the infection. When a continuously high temperature, lasting from a day to a week, is observed, it is usually due to the establishment of a fresh focus of bronchopneumonia. Hæmoptysis is almost invariably followed by several days of continued fever.

With the hectic temperature there are usually sweats. These are the result of septic infection and as a rule occur at night—hence the term “night sweats”—although they may appear at any time.

The pulse is accelerated even early in the disease and this increase in its rate is often an important point in the diagnosis of incipient tuberculosis.



The difference of pulse rate caused by slight exertion is more marked than in health.

The respirations are not markedly increased in number even with considerable pulmonary involvement. Dyspnoea may occur when there is pneumonic involvement, when there is serous pleurisy or pneumo-thorax, and in old infections with emphysema or with pleural thickening and retraction of the thorax.

Emaciation is progressive and is a pronounced and constant symptom. It is a dependable index of the progress of the disease.

Late in the disease manifestations due to involvement of other organs often occur. Tuberculosis of the intestine is evidenced by obstinate diarrhoea. Meningeal infection causes headache and other cerebral symptoms (*see* p. 791). Amyloid and fatty degeneration of the viscera result in enlargement of the organs affected and, in the case of the kidneys, albuminuria. Tuberculosis of the genito-urinary tract with pus and tubercle bacilli in the urine may occur.

Physical Signs. These vary with the stage of the disease. Careful physical examination of the chest is very important in all suspected instances and the early physical signs, *i. e.*, those present in the incipient or so-called pre-bacillary stage, while typical and easily detected by the acute observer, may be overlooked. These are: (a) Myoidema of the chest muscles. This phenomenon, while not characteristic of pulmonary tuberculosis, is significant of a hyperæsthetic condition of the reflexes and is likely to occur as a result of any disease interfering with nutrition. (b) Upon auscultation of the heart the second pulmonic sound is found to be accentuated owing to the obstruction to the pulmonary circulation caused by the inflammatory process in the lung. (c) The cardiac sounds are heard at the apex of the lung as a result of transmission through the infiltrated pulmonary tissue. (d) The whispering voice at the apex or just below the clavicle is bronchial in character. (e) A blowing murmur in the subclavian or the pulmonary artery may be present. Upon these signs the diagnosis can be made even before distinct dulness upon percussion or the presence of râles can be detected, or the Röntgen-ray gives any information.

In the more advanced *first stage* of the disease the signs are:

(a) *Inspection.* The shape of the chest, while not characteristic, is often long and narrow with wide intercostal spaces and ribs tending toward the horizontal in direction. The scapulæ are of the "winged" type. The thorax in other instances may be flattened antero-posteriorly and the costal cartilages are prominent. The angle of Louis is usually present in this stage. Depression above the clavicle and retraction below are important signs, the clavicle being more prominent than normal. If found in women it is of greater significance than in men. The body may be more or less wasted, the respiration may be slightly accelerated and the pulse rate increased. A cardiac

apex pulsating over an increased area is suggestive of involvement at the left apex. On deep inspiration one side of the thorax will often expand less than the other; especially is this diminution of expansion noticeable above and just below the clavicle.

(b) *Mensuration* often reveals not only a diminished expansion of the affected side but the fact that this half of the chest is of less circumference than the other while at rest.

(c) *Palpation* may detect the presence of increased fremitus over the affected apex, but the normal exaggeration of the fremitus of the right over that of the left apex should not be forgotten.

(d) *Percussion*. At this stage the note above or just below the clavicle is usually duller than normal.

(e) *Auscultation* reveals an increase in the length of the expiratory murmur and a diminution in the intensity of the inspiratory sound, or the latter has become harsh or broncho-vesicular. The vocal resonance is increased, the whispered bronchophony above referred to is present and the physical signs of a more or less generalized bronchitis are usually obtainable. Crepitant and subcrepitant râles at the apices are a frequent and characteristic sign. They may be due to pleuritic adhesions, in which case they are close under the ear, occur with both inspiration and expiration and are increased upon pressure by the stethoscope, or to bronchitis. In this event they are more distant, are heard at the end of inspiration and are not increased on pressure. Deep inspiration followed by coughing may render them audible when they cannot be detected upon ordinary respiration.

In the *second stage* inspection reveals an exaggeration of the changes already described, the emaciation is more pronounced, the hectic flush may be present and the surface temperature may be heightened. The angle of Louis now becomes more prominent. The exaggerated vocal fremitus may be easily detected unless a thickened pleura prevents its recognition. The percussion note is now distinctly dull.

Auscultation reveals an increased and perhaps a broncho-vesicular quality of the spoken voice, the breathing has become more bronchial in character and both inspiration and the expiration are prolonged and are blowing in quality. Ultimately the breathing and voice, as the consolidation becomes more pronounced and of greater extent, become bronchial. Râles due to pleuritic and bronchial inflammation are also present.

The signs revealed during the *third stage* by inspection are those of the second in a more advanced condition; the wasting is still more apparent, the retraction of the chest is more marked, the respiratory movement more restricted. The surface temperature is perceptibly increased, the skin may be moist if sweating is present, and the vocal fremitus is further exaggerated. The dullness on percussion is often increased to flatness and, upon the occurrence of cavity formation, becomes tympanitic, amphoric or "cracked pot"

in character, if the lesion is near the surface. The note may be unchanged if the cavity is small and deeply-seated. Wintrich's sign is pathognomonic; given a cavity communicating with a bronchus, with smooth and thickened walls and not filled with secretion, the note elicited by percussion is higher in pitch with the mouth shut than when it is open.

Auscultation reveals the presence of moist râles resulting from the softening and breaking down of the tuberculous deposits. Over cavities the breathing is cavernous or amphoric and the voice possesses similar quantities; pectoriloquy upon whispering or speaking may be present. The amphoric quality is given to the breathing if the cavity walls are firm and smooth, while with softer walls a cavernous quality is transmitted to the voice. Gurgling râles may be caused by the air passing through the fluid contents of a cavity.

Diagnosis. Of chronic phthisis this presents difficulties during the early stages only; unfortunately the presence of the bacillus in the sputum is not likely to occur until there is ulceration or disintegration of the tuberculous nodules. It is most important that the diagnosis should be made as early in the disease as possible, for at this time treatment, properly applied, is able, in most instances, to effect a cure. The early physical signs upon which stress should be laid are the presence of slight dulness and diminished breathing and prolonged expiration at the apices, together with whispering bronchophony, a transmission of the heart sounds toward the apices and an accentuation of the second pulmonic sound. These last three signs are obtainable often several months before the Röntgen-ray will give a shadow. An increased rapidity of the pulse, slight evening rises of temperature, coupled with flushed cheeks, dilated pupils, and perhaps loss of flesh, are always suspicious. Stains of blood in the expectoration, though these may come from the naso-pharynx, should always lead the physician to make a most careful physical examination. It may be stated that the patient in whom a pulmonary hæmorrhage is an early symptom is fortunate since it induces him to consult the medical man and to watch his own condition most carefully.

The tuberculin test may be employed in doubtful instances; it is without danger and is usually reliable. Its technique is as follows: A hypodermatic injection of one-sixtieth of a grain (0.001) of pure tuberculin is given. Should no febrile reaction ensue within ten or twelve hours the dose is doubled two or three days later and is progressively increased until one-twelfth of a grain (0.005) is given. If no rise of temperature is evident after this dosage tuberculosis is probably absent. Calmette's tuberculin test consists of instilling into the eye two minims (0.13) of a one-half to one percent. solution of tuberculin. This, within twenty-four hours, produces hyperæmia of the conjunctiva, at times a true inflammation, which subsides within a day or so. Von Pirquet rubs the same solution into the slightly abraded skin with moderate friction. If the patient is tuberculous, a pustule will appear within twelve days. Both of these tests are often positive in

children who have not tuberculosis. A low opsonic index to the tubercle bacillus is suggestive of a predisposition to the disease. The agglutination and serum tests advocated by Arloing and Courmont may prove to be very useful. Early in the disease the Röntgen-ray has only a limited use in the diagnosis since the only noticeable abnormality is a diminished excursion of the diaphragm upon the affected side. Areas of consolidation are indicated by distinct shadows and special infiltrations may be evidenced by a blurred appearance upon the plate.

2. *Fibroid Phthisis.*

In this disease, associated with the tuberculous process, there is a productive inflammation of the lung resulting in an increased growth of fibroid tissue. The condition is gradual in onset and it may occur following chronic ulcerative phthisis or it may be engrafted upon a tuberculous bronchopneumonia or pleurisy. The lung is firm, tough and grayish on section as a result of the over-growth of fibrous tissue; the bronchi may be dilated and bronchiectatic cavities are often present; tuberculous cavities are observed at the apices; cheesy foci surrounded by fibrous tissue may be present; in the last two lesions tubercle bacilli are to be found. While one lung is in the condition described the other may be emphysematous or contain miliary tubercles. The right ventricular wall of the heart, and sometimes the left as well, is hypertrophied and there may be amyloid degeneration of the viscera.

Symptoms. Cough is present and is frequently paroxysmal, but this, with the other symptoms, emaciation, fever, etc., is less pronounced than in ulcerative phthisis. The sputum is often profuse, owing to the presence of bronchiectatic and other cavities, and may be foetid. Bacilli are less easily found than in ordinary chronic phthisis. Pulmonary hæmorrhage may occur and œdema of the feet may result from failure of the heart's action. The course of the disease is usually protracted.

Physical Signs. The chest wall over the diseased lung is sunken and the heart may be displaced owing to retraction of the lung. The intercostal spaces are narrow and the area of the cardiac apex beat may be much enlarged. The characteristic percussion note is dull and high-pitched; vocal fremitus is diminished. Auscultation may reveal the presence of cavities, especially at the apices, elsewhere there are areas of bronchial breathing and increased vocal resonance, unless the pleura is thickened. Bronchiectatic cavities may be present in the middle or lower lobes. The signs of emphysema may be noted in the other lung, and cardiac murmurs are not infrequent.

Prognosis. In the ulcerative as well as in the fibroid form of the disease, although the duration of the latter type is longer, the prognosis is serious, but it is certain that many subjects of pulmonary infection with tuberculosis do spontaneously recover. This is proven by the numberless necropsies, in

deaths from other causes, in which healed tuberculous lesions are found. In these the tubercles have undergone fibroid or calcareous degeneration. In the encapsulated caseous masses while the process may be considered inactive it cannot be said to have wholly ceased to exist. Even patients in whose sputum bacilli and elastic tissue have been demonstrated have recovered; consequently in the light of the above stated facts we may safely say that pulmonary tuberculosis is a curable disease.

The patients in whom the prognosis is most favorable are those with good heredity, previous robust health and good digestion, slow invasion, only slight febrile movement and slight pulmonary involvement. When the initial inflammation is pleuritic, recovery may be considered probable, while the opposite is true of subjects with frequent pulmonary hæmorrhages.

The average duration of the disease differs, being, according to the statistics of different observers, from two and a half to seven years. Proper treatment will, in the great majority of instances, render the patient more comfortable and materially prolong his life.

Prophylaxis. This consideration is quite as important as treatment, for in the light of our present knowledge the disease is distinctly preventable in most instances.

The public should be educated by such means as those employed by the Department of Health of New York City, and pulmonary tuberculosis should be considered a reportable disease on account of its infectious character. The following is a copy of a circular issued and circulated by the New York Health Department indicating that an attempt is being made to awaken the masses to the importance of the crusade against tuberculosis.

"Consumption is a disease of the lungs, which is taken from others, and is not simply caused by colds, although a cold may make it easier to take the disease. It is caused by very minute germs, which usually enter the body with the air breathed. The matter which consumptives cough or spit up contains these germs in great numbers—frequently millions are discharged in a single day. This matter, spit upon the floor, wall, or elsewhere, dries and is apt to become powdered and float in the air as dust. The dust contains the germs, and thus they enter the body with the air breathed. This dust is especially likely to be dangerous within doors. The breath of a consumptive does not contain the germs and will not produce the disease. A well person catches the disease from a consumptive only by in some way taking in the matter coughed up by the consumptive.

"Consumption can often be cured if its nature be recognized early and if proper means be taken for its treatment. *In a majority of instances it is not a fatal disease.* It is not dangerous to live with a consumptive, if the matter coughed up by him be promptly destroyed. This matter should not be spit upon the floor, carpet, stove, wall or sidewalk, but always, if possible, in a cup kept for that purpose. The cup should contain water so that the matter

will not dry, or better, carbolic acid in a five percent. watery solution (six teaspoonfuls in a pint of water). This solution kills the germs. The cup should be emptied into the water-closet at least twice a day, and carefully washed with boiling water.

"Great care should be taken by consumptives to prevent their hands, faces, and clothing from becoming soiled with the matter coughed up. If they do become thus soiled, they should be at once washed with soap and hot water. Men with consumption should wear no beards at all, or only closely cut mustaches. When consumptives are away from home, the matter coughed up should be received in a pocket flask made for this purpose. If cloths must be used, they should be immediately burned on returning home. If handkerchiefs be used (worthless cloths, which can be at once burned, are far better), they should be boiled at least half an hour in water by themselves before being washed. When coughing or sneezing, small particles of spittle containing germs are expelled, so that consumptives should always hold a handkerchief or cloth before the mouth during these acts; otherwise, the use of cloths and handkerchiefs to receive the matter coughed up should be avoided as much as possible, because it readily dries on these, and becomes separated and scattered into the air. Hence, *when possible, the matter should be received into cups or flasks.* Paper cups are better than ordinary cups, as the former with their contents may be burned after being used. A pocket flask of glass, metal, or pasteboard is also a most convenient receptacle to spit in when away from home. Cheap and convenient forms of flasks and cups may be purchased at many drug stores. Patients too weak to use a cup should use moist rags, which should at once be burned. If cloths are used they should not be carried loose in the pocket, but in a waterproof receptacle (tobacco pouch), which should be frequently boiled. A consumptive should never swallow his expectoration.

"A consumptive should have his own bed, and, if possible, his own room. The room should always have an abundance of fresh air—the windows should be open day and night. The patient's soiled wash-clothes and bed linen should be handled as little as possible when dry, but should be placed in water until ready for washing.

"If the matter coughed up be rendered harmless, a consumptive may frequently not only do his own work without giving the disease to others, but may also thus improve his own condition and increase his chances of getting well.

"Whenever a person is thought to be suffering from consumption, the Department of Health should be notified and a medical inspector will call and examine the person to see if he has consumption, providing he has no physician, and then, if necessary, will give proper directions as to treatment. Rooms which have been occupied by consumptives should be thoroughly cleaned, scrubbed, whitewashed, painted or papered before they are again

occupied. Carpets, rugs, bedding, etc., from the rooms which have been occupied by consumptives, should be disinfected. Such articles, if the Department of Health be notified, will be sent for, disinfected and returned to the owner free of charge, or, if he so desire, they will be destroyed.

"When consumptives move they should notify the Department of Health.

"Consumptives are warned against the many widely advertised cures, specific and special methods of treatment of consumption. No cure can be expected from any kind of medicine or method, except the regularly accepted treatment, which depends upon pure air, an out-of-door life and nourishing food."

This last statement is, of course, untrue.

Legislation with reference to the sanitary condition of tenement houses, to the inspection of the sources of our meat and milk supply and against promiscuous expectoration is a necessary step in prevention, as well as thorough disinfection of rooms and their contents, after occupation by tuberculous individuals, and the establishment of municipal, state or even federal sanatoriums and tuberculosis dispensaries. At least one of the hospitals of New York City has a corps of visiting nurses who go to the houses of patients who are under treatment at the institution's out-patient department and instruct the family in the necessity of cleanliness, in the care of sputum, etc.

The sputum, being the chief means by which the disease is disseminated, should be thoroughly and at once destroyed. It should be received into earthen or enamel-ware cups in which a one to one thousand solution of mercury bichloride or a four percent. solution of phenol is constantly kept; where it is impossible to procure these germicides water should be substituted since the bacilli unless dried are not carried by the air, or the patient may expectorate into bits of old muslin or even a Japanese napkin which is to be immediately burned. The burnable pasteboard sputum cup is a useful and safe appliance. All permanent receptacles for sputum should be scalded out with boiling water at least once a day.

The proper care of delicate children, whether born of tuberculous parents or not, is most important. The tuberculous mother should not nurse her child, and the general surroundings of the predisposed infant should be of the most healthful character. Catarrhal diseases are much to be feared, consequently the child should not be allowed out of doors upon cloudy, damp days during the cold months, and the conditions of the upper air passages should be kept as healthful as possible. The importance of the removal of adenoids and hypertrophied tonsils cannot be over-estimated. Proper clothing—woolen next the skin—should be worn. After the child's bath, sponging with cold water—60° to 70° F. (15.5° to 21° C.)—is an excellent method of hardening. The diet should be plentiful, plain and nourishing, and a liking for milk, if not already present, should be cultivated. All illnesses, no matter how insignificant, should be carefully treated and the

administration of such tonics as iron, especially syrup of iron iodide, arsenic and codliver oil, may be attended with benefit. As the child grows older he should be encouraged to lead an out-door life, exposure to cold and wet, however, being avoided, and in the pursuance of gymnastic and respiratory exercises. When it becomes necessary to choose his life-occupation one which will tend to keep the subject in the open air as much as possible is to be preferred.

Protection by Immunization. Von Behring claims to have discovered a method of immunization of man which is sure, rapid and without danger. He believes that the immunizing substance is contained in the bodies of the tubercle bacilli and acts by combining with certain living cellular elements. His theories have been proven by animal experimentation and he believes that it is possible by the same methods to protect the human subject against tuberculous infection. The discovery is not to be given to the world until further experimentation and clinical study have been carried out. A statement, like the above, coming from high authority carries much weight.

Treatment. Pulmonary phthisis is an infection and should be treated as such. The patient's life should be regulated and his condition watched as carefully as in enteric fever or diphtheria. Each patient is a law unto himself, consequently no one method is applicable in all instances and seldom does any single method succeed in a given subject, the best results being obtained by a combination of appropriate modes of treatment. Climatic treatment, dietetic treatment, drug treatment, each has a distinct place but we should not be satisfied to employ them singly; we should use all means at our disposal, keep up the patient's nutrition, constantly watch him in every phase of his disease and work continuously to benefit him. The special considerations are to improve the nutrition by proper hygienic mode of life and feeding; to arrest the tuberculous process; and to relieve the unpleasant symptoms as they arise.

Climatic Treatment. When it is possible to remove the patient, a suitable climate should be sought as soon as the diagnosis is suspected. The ideal climate is dry, of equable temperature, and one which affords the largest number of sunny days; such a one is, however, impossible to find since no dry climate can possess an equable temperature, consequently we should select a region the meteorological characteristics of which approach as nearly as possible to this ideal. In many instances it will be impossible to choose a climate for a given patient and the only possible method of selection is to experiment until one is found in which the subject does well. In general it may be stated that an altitude of from two thousand to twenty-five hundred feet is more favorable than a low lying region. Another important consideration is that the patient must not be sent to a place where good accommodations and food cannot be obtained.

Evans gives the following useful classification of climates.





1. Cool moderately moist climate, general elevation two thousand feet—the western slope of the Appalachian range, the Adirondacks, Catskills, Alleghanies, and Cumberland mountains.

2. Moderately warm and moist climate, elevation two thousand two hundred and fifty feet—Asheville, N. C.; Aiken, S. C.; Marietta and Thomasville, Ga.

3. Warm and moist climate—the coast regions of Florida and Southern California.

4. Warm and moderately dry climate, elevation about two thousand feet—South-western Texas and Southern California, inland.

5. Cool and moderately dry climate, elevation about one thousand feet—Minnesota, Nebraska, and Dakota.

6. Cool and dry climate, elevation four to seven thousand feet—Montana, Wyoming, Colorado, Northern New Mexico and Western Kansas; Davos and St. Moritz, Europe.

7. Warm and dry climate, elevation three to five thousand feet—Southern New Mexico and Southern Arizona.

The Adirondacks are a very favorite resort for the tuberculous of the vicinity of New York City and, even though the elevation is considerable, the permanence of an established cure is not jeopardized by a return to sea-level. The patients who do best at an altitude are those in whom the disease has not gone on to cavity formation and whose nutrition is good; the opposite is true of advanced infections, especially if emphysema or cardiac weakness is present. Such conditions usually contra-indicate removal to a high altitude, and the patient is more likely to be benefited by a moist and warm climate than by one which is cold and dry. In conclusion it may be stated that life in the open air is essential in whatever climate the patient may be.

Mountain Sickness. This is a condition produced by rarefied air on the organism and is frequently seen in tuberculous patients who are sent to a high altitude. Its cause is probably a diminished intake of oxygen. It is marked by a rapid pulse, oppression, dyspnœa, intense malaise, headache, vertigo, and at times nausea and vomiting. There is a febrile reaction of moderate degree, thirst from the parched mouth, and inappetence. Exertion is followed by marked exhaustion. Frequently hæmoptysis has been noted. The outlook depends upon the disease present and especially its extent. The patient must at once be put at rest in the horizontal position, given oxygen by inhalation if necessary, and gradually he will become acclimatized.

Hygienic treatment consists in first securing ventilation and sunlight. The dwelling should be situated upon high rather than low ground and should be as accessible to the sun as possible. The importance of the latter consideration is shown by the fact that instance after instance of tuberculosis continued to occur in certain houses in Massachusetts until the removal of the

many trees about them. After this was done the disease disappeared as if by magic. Proper drainage is important, and cellars are not to be forgotten, and the patient's apartment should be one to which the sunlight has access for as much of the day as possible. Ventilation by a fireplace is to be advised and the patient should sleep with the windows open even in the coldest weather, but protection from draughts must be secured. The air within the sleeping-room should be identical, so far as is possible, with that out of doors.

During the day the patient should spend as much of the time in the open air as possible and should take such exercise in moderation as the condition of his circulatory apparatus will allow. Sitting in the sunlight should be encouraged, but it is better to keep in motion if the physical condition permits.

The employment of hydrotherapeutic treatment as a curative measure may be neglected; it is, however, important in prophylaxis. Daily baths should be taken in order to keep the skin and circulation active. Cool water may be used but not unless the rub down after the bath is succeeded by a good reaction. The risk of chilling the body should not be taken.

Breathing exercises are important and by their means the lung capacity and chest expansion are capable of a considerable increase. They consist in taking several successive deep breaths, the patient standing upright in the open air meanwhile. Each breath is held for a few seconds and then slowly exhaled. In proper instances, the condition of the heart permitting, calisthenics in moderation are excellent. The exercises which comprise the "setting up drill" of the United States Army are excellent and may be employed.

The patient's clothing is an important consideration; wool, of weight varied according to the temperature, should be worn next the skin at all seasons of the year, both day and night. As a sleeping dress nothing is better than pyjamas of flannel or a night-gown reaching to the feet.

The open-air treatment has been much exploited of late and is undoubtedly a method of great value. It may be employed at home in the city or country or in institutions. It may be difficult to carry out in the city, but if the physician insists upon its importance it will be possible to overcome many obstacles. The roof of the main house or of an extension, or the back yard may be used upon pleasant days, and an ordinary steamer chair provided with cushions and blankets makes an excellent couch if it is necessary that the patient recline. The important factor is fresh air; the means to obtain it vary according to circumstances. Tents, portable houses, and the wilderness cure are only means. In the city, window tents and open windows may accomplish the same purpose. The most convenient and practical method has been devised for a city house as follows: A roof of a two-story extension open on the south and west was protected overhead and on the two sides with canvas which could be entirely rolled up. A railway

was built from the out-door room through the window into the dressing room. A frame bed on wheels was mounted on the way. The bed was fully equipped with the addition of a sleeping bag. The patient, undressed, entered the bag upon the bed, was protected, and the bed on its carriage run out of the room. An electric announcer completed the outfit. In cold weather hot water bags should be placed to the feet and the head protected by a hood and possibly a veil; if the atmosphere should happen to be dusty, a respirator should be worn. In this way all chilling and exposure of the patient was obviated. In the day time the porch was furnished with steamer chairs and blankets, and was used as a sitting room. Days upon which it is not advisable to send the patient actually out of doors he should recline, warmly wrapped, if necessary, before the open window of his apartment which should be the most sunny and airy room in the house. At night the windows should be open so that, unless the weather absolutely forbids, the patient spends practically all his time in the open air. Such symptoms as fever, sweats and hæmoptysis should not be allowed to interfere with the treatment.

The *sanatorium treatment* has recently been developed to a considerable degree. The great advantage of institutional treatment is that the patient's mode of life is in every way regulated upon the lines most beneficial to him. Exercise, sleep, diet, amusement, etc., are arranged in accordance with the most hygienic methods. Routine treatment should not be employed but only those measures selected which are likely to be suitable, and experience has shown to be proper, for each patient. Emphasis must be laid upon the importance of the establishment of public sanatoriums near large cities so as to be available for early infections and patients of moderate means.

Tent life for the tuberculous. This mode of treatment is only another phase of the out-door fresh air method. Tents or tent cottages may be constructed according to any desirable plan, and life in these is practically an existence in the open air.

Dietetic treatment is perhaps the most important consideration in the management of pulmonary tuberculosis but presents certain difficulties. The importance of proper feeding cannot be too strongly emphasized; the well-nourished organism is able to combat successfully tuberculous infection and it is certainly probable that the poorly nourished organism which is the subject of a tuberculous infection can better meet this prejudicial condition if its nutrition is improved in every possible way. Many patients will state that they cannot eat, yet if they are encouraged to try, they will, before the meal is finished, give evidence of a very respectable appetite.

Any system of feeding which departs markedly from the proper proportion of proteids, fats, and carbohydrates is not a wise one, as is shown by the failure of the raw-beef and hot-water treatment; this fails in a large proportion of patients because the amount of albuminous material is so great that

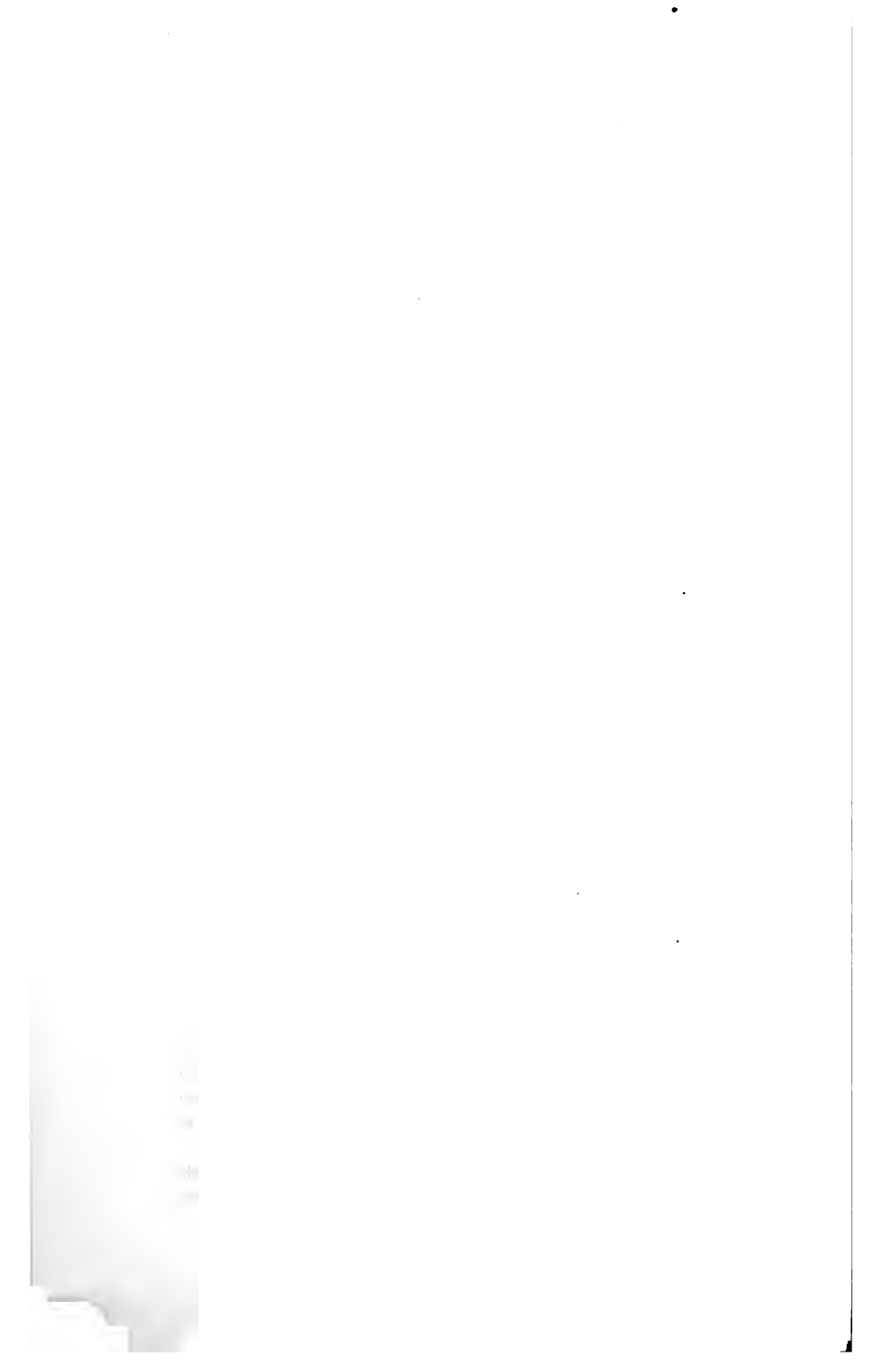
it overtaxes elimination. The Debove method of treatment by over-feeding (gavage, *see* p. 677) may be followed by considerable gain of flesh but unfortunately, while the increase in weight is going on, the tuberculous process remains stationary or retrogrades, and the method has the additional disadvantage that very careful watching of the patient is required to prevent the disagreeable consequences of over-feeding. This mode of feeding is best reserved for patients with tuberculous laryngitis where it has one distinct advantage that is of great value in certain instances. It is a curious fact that these patients, who are often prone to vomit, a very distressing symptom in tuberculosis of the larynx, seldom do so when food is introduced by the stomach tube.

The proper diet for patients suffering from pulmonary tuberculosis should consist of meats, starches, and fats, with an excess of the last, and a certain amount of phosphates. Light and nutritious food should be given, it should be easily digestible and the meals should be frequent. They should be separated into those containing the bulk of the starchy food and those consisting chiefly of proteids. Three to three and a half hours should be allowed for the digestion of the heavier meals so that the stomach shall be fairly emptied before it receives the next consignment of food.

The first meal should be at about seven in the morning when the patient takes a glass of warm (not hot) milk containing a tablespoonful of strong coffee made according to the French method, or, if the previous night has been an exhausting one, a dessertspoonful of rum or other spirit which has previously been mixed with enough water to reduce its alcohol content to not more than five percent., otherwise the spirit will coagulate the albumin of the milk and render it less digestible. Breakfast is taken at nine. The patient is allowed eggs cooked in any way except by frying, although if frying is preferred it may be done in the Italian method, *i. e.*, in olive oil. Prepared thus, eggs are much less indigestible than when fried in lard. Bread is also permitted and marmalade if the patient likes. Finnan haddie pleases certain patients, when it is cured by smoking and without salt, and it seems to agree with them although it is a theoretically incorrect article of diet. Toasted bread or good rolls (not hot) are allowable and bread and butter, milk and coffee may be used for variety.

About eleven o'clock the patient has the second breakfast, which usually consists of a little cocoa from which the fat has been removed. Cocoa butter is one of the most indigestible fats, therefore it should be removed, or else predigested. The patient may also have coffee, a little bread, a little soup, or a little beef extract. An eggnog is permissible, and kumyss or matzoon is often acceptable.

The dinner should be served about one o'clock in the afternoon, and should be the meal of the day. The patients may have any kind of meat they relish, except salted meats, but it must not be fried. Potatoes, fresh



vegetables, fruits, and puddings may also be allowed. Coffee, tea, or possibly a bottle of light beer, may be added.

About four o'clock in the afternoon they should have a little meat extract with toasted bread, and about five, a little more should be given. About seven o'clock in the evening comes supper, consisting chiefly of farinaceous food. Many of these patients like what is known as hasty-pudding which is made by putting corn meal into a kettle with water, and stirring it while it is boiling, seasoning to taste. Various jellies, beef extracts, and gruels are useful at this time. If the patient is awake at eleven o'clock a cup of milk or hot soup may act as a hypnotic.

Patients who exhibit a hectic temperature are better without alcohol after the one o'clock dinner because the alcohol seems to increase the fever. In general alcohol should be taken only in moderate amount and well diluted. After noon, only beer is to be permitted, with, perhaps, stout upon retiring.

The starchy foods, since upon these we must depend to improve nutrition, should be given with as little liquid as possible and their digestibility should be increased by the addition of a malt extract, which in itself is nutritious and contains diastase. All liquid malt extracts are utterly useless for the transformation of starch into dextrin and maltose, because they contain sufficient alcohol to inhibit the effect on the starch, and because they contain acids, generated in the process of fermentation, which also inhibits the action of the diastase. The semi-solid extracts of malt convert starch into sugar. This conversion commences to take place in the mouth. For the first thirty or forty minutes after food has been taken into the stomach, this process goes on. It later stops, but recommences in the duodenum and continues until all the starches are converted into dextrin, and finally into maltose. That this conversion continues in the stomach has been proven conclusively by Kellogg. The great disadvantage of most of the active preparations of malt is their viscosity, which renders them, after a little time, objects of disgust. It is now possible to obtain a preparation of malt, which contains from four to five percent. diastasic converting power. With such preparation as maltzyme we can be assured that the starches will be digested. The starches are for nourishment, for the generation of heat, and for the formation of fat. This is just what one desires for a tuberculous patient. Further than this, recent investigations tend to show that the sugars are important in the generation of force. That is to say: Under a constant diet more than a proportionately larger amount of energy is developed if sugar be added to the dietary.

Life in the open air is a great stimulant to the appetite and an occasional gastric lavage may remove the mucus from a sluggish stomach and increase the desire for food; a dose of one of the vegetable bitters taken before meals now and then is an excellent measure. Of these perhaps the best is condurango, dose of the fluidextract twenty to thirty drops (1.30 to 2.0). Nuxvomica and gentian are also to be recommended.

Medicinal Treatment. Creosote has been employed in pulmonary tuberculosis since 1842 and is perhaps the only remedy which has never been abandoned. Its chief disadvantage is that it is often irritant to the stomach and the kidneys, but this can be avoided in great measure by the use of creosote carbonate or possibly of pure beechwood creosote. The former is preferable since it may be, on account of its less irritant qualities, administered in much larger dosage. It contains ninety-two percent. of creosote and may be given in dose of from fifteen to sixty minims (1.0 to 4.0) in a wineglass (60.0) of sherry after meals or in milk or bouillon. It may also be given in codliver oil, one part to ten. Creosote carbonate is slowly absorbed and is probably eliminated chiefly by the bronchial mucous membrane. It is the drug upon which we place our chief reliance in treating pulmonary tuberculosis.

Creosote itself may be used in various ways, but it is very important that it should be pure; it is frequently contaminated with phenol the presence of which may be proven by moistening a match with the suspected fluid; if impure the wood is stained bluish. Creosote may be administered in the form of an emulsion with codliver oil and acacia, with codliver oil and the hypophosphites, with syrup of wild cherry and acacia, two minims (0.12) of creosote to one drachm (4.0) of the emulsion in each case—or in a mixture of glycerin and whiskey. The dose of creosote should be one-half to two minims (0.03 to 0.12) given thrice daily and gradually increased to twenty to twenty-five minims (1.30 to 1.65) in the twenty-four hours. Given in pills coated with keratin, which will dissolve only in the intestine, a daily dosage of from forty-five to fifty minims (3.0 to 3.5) can be reached without inconvenience. The following prescriptions may be found useful: \mathcal{R} creosoti \mathfrak{Z} i (4.0), tincturæ nucis vomicæ \mathfrak{Z} ss (15.0), tincturæ gentianæ compositæ q. s. ad \mathfrak{Z} iv (120.0). Misce et signa, one teaspoonful three times a day after meals; \mathcal{R} creosoti \mathfrak{Z} i (4.0), balsami tolutani gra. cv (7.0), terpini hydratis gra. xv (1.0), acidi benzoici, q. s. Misce et divide in pilulas numero lxxx. Signa. Take ten pills each day. The hypodermatic administration of creosote in sterile oil requires a special apparatus and is very tedious and painful. Creosote by inhalation is especially indicated when the sputum is foetid. The sponge of a perforated zinc inhaler is wet with a mixture of equal parts of beechwood creosote, spirit of chloroform and alcohol, and the apparatus is used for fifteen minutes in every hour.

If the dosage of creosote, when given by mouth, is increased too rapidly, nausea, epigastric distress, and even vomiting may result and the urine may become darkened and contain blood and granular casts, but if the increase of dose is slow the patient may acquire a tolerance for the drug; fifty minims (3.50) should be considered a maximum daily dosage. When it is impossible to give creosote by mouth it may be given in enema which is made up of one-half to one drachm (2.0 to 4.0) of creosote dissolved in six drachms (25.0) of oil of sweet almond. This is emulsified by the addition of the yolk of an egg

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and the whole is mixed with six ounces (200.0) of water. A more easily made enema consists of from fifteen to forty-five minims (1.0 to 3.0) of creosote mixed with four to eight ounces (125.0 to 250.0) of water. This should be thoroughly agitated before administration and may be given three times daily. This method is preferable to its hypodermatic administration and is specially indicated in tuberculous diarrhoea or enteritis. It should be borne in mind that after maximum doses of creosote have been employed for considerable periods of time and for any reason it becomes necessary to omit its use the initial dose should be the minimum one, else considerable distress will be produced.

An excellent substitute for creosote is gomenol, an oily liquid analogous to oil of cajuput and distilled from the leaves of *melaleuca viridiflora*; its dosage is from thirty to sixty minims (2.0 to 4.0) in capsules daily. This can now be obtained in glutinules which pass through the stomach unchanged and the remedy is absorbed from the small intestine. Another substitute is guaiacol—eight minims (0.5)—three times a day, or, better, guaiacol carbonate, the dose of which is twice as large.

Codliver oil is a valuable aid in the treatment of tuberculosis. Pure oil is unpleasant to the taste of most adults, but fortunately children frequently take it with avidity. The objections of older persons may be avoided by giving it in soft capsules or in the official emulsion. Some patients are able to take the oil by previously rinsing the mouth with whiskey or brandy or by putting a little salt in the mouth after swallowing the dose. To render the oil less unpalatable ten minims (0.65) of pure ether or a drop or two of oil of peppermint or clove may be added to each dose. One part of essential oil of eucalyptus is said to entirely do away with odor and taste, and a nutritious combination may be made by rubbing together equal parts of codliver oil and malt extract. Another method of disguise is to add to four hundred parts of the oil ten parts of animal charcoal and twenty of ground roasted coffee; the mixture is digested on a water bath at 122° to 140° F. (50° to 60° C.) and after standing for three days is filtered and stored in well-stoppered bottles. Iron may be combined with the oil as follows: \mathcal{R} olei morrhuae, \mathfrak{Z} iv (15.0), ferri et ammonii citratis, gra. v (0.30), potassii carbonatis, gra. iii (0.20), benzosulphinidi (saccharin), gr. $\frac{1}{4}$ (0.015), olei cari, \mathfrak{m} $\frac{1}{4}$ (0.015), aquæ destillatæ q.s., ad \mathfrak{Z} i (30.0).

Codliver oil is considered to be contra-indicated in diarrhoea, hæmoptysis, dyspepsia, vomiting, and fever.

The hypophosphites are useful especially in the primary stages when our prime object is to improve the patient's nutrition. It is important that they should be chemically pure and neutral in reaction, for the presence of free alkali or alkaline carbonates quickly causes an atonic dyspepsia. The official compound syrup of hypophosphites is faulty in that each salt has a peculiar property; the final effect of hypophosphite medication is due to the

beneficial effect upon nutrition of the particular salt prescribed. In the early stages of phthisis (infiltration) the sodium salt only should be administered; where cavities are present the calcium salt only is indicated, provided that it does not too suddenly check expectoration, when the sodium salt should be resumed. The potassium salt is a valuable expectorant in chronic bronchitis, but its usefulness in phthisis is limited. The hypophosphites, intelligently administered, will improve nutrition and relieve certain of the symptoms of pulmonary tuberculosis, but when given in too large doses, or simultaneously with iron, arsenic, strychnine or other stimulants or codliver oil, they are likely not only to fail but to cause digestive disturbances. Quinine hypophosphite is useful in the last stages of the disease only, and then probably merely as a placebo.

It has been recently suggested that mercury succinimide in dose of one-fifth of a grain (0.01) given hypodermatically every second day for two months followed by a course of potassium iodide one-half drachm (2.0) per day, for two weeks, then rest for a week and repeat the mercury in small doses, for a second course, is of great importance. Although some patients appear to be benefited the value of this treatment certainly has not been demonstrated.

The tonics, especially iron and arsenic, are often useful to combat the secondary anæmia of chronic phthisis. The latter should not be given to alcoholics or to patients who suffer from gastro-intestinal disturbances or hæmoptyses. It is often wise to give the arsenic for three days in the week or fifteen days in the month. It may be given in the form of sodium arsenate one-twelfth to one-fourth of a grain (0.005 to 0.016), or as Fowler's solution, two to eight minims (0.13 to 0.5) three times a day. The latter may, if necessary, be administered *per rectum* mixed with water in dosage twice the size of that given by mouth. Sodium cacodylate which contains fifty percent. of arsenic may be given in pill form—each pill to contain one-sixth of a grain (0.010)—from three to six pills a day, and in the anæmia of those predisposed to tuberculosis this drug combined with iron and ammonium citrate is to be recommended.

Treatment of Special Symptoms. Fever necessitates rest, which of course should be taken in the open air. Quinine and the salicylates are of little use; the former, if given in dose large enough to control the temperature is very prone to disturb the digestion. Small doses of antipyrine salicylate, acetphenetidine or antipyrine are often effectual. Temperatures above 103° F. (39.5° C.) may be relieved by sponging with cool water.

The cough, if slight, may be relieved by simple mixtures containing dilute hydrocyanic acid two to three minims (0.12 to 0.20) to the dose; as vehicles the syrups of tolu or wild cherry may be employed. Syrups, however, when continued, are very apt to disturb the gastric functions. More distressing cough necessitates the administration of heroin $\frac{1}{40}$ to $\frac{1}{20}$

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of a grain (0.0016 to 0.0032) or codeine, one-fourth to one-half a grain (0.016 to 0.0032) every four hours. In the advanced stages frequently only morphine will relieve this symptom. Sufficient quantity may be given to control the cough during sleep but not so much as to inhibit the expectoration of the accumulation of the night when the patient awakes. This may be facilitated by administering a glass of hot milk or a milk punch. If the bronchial secretions are tough and not easily raised they may be softened and their expectoration made less difficult by the administration of soluble capsules containing terpene hydrate five grains (0.30) and heroine one-twentieth of a grain (0.003). Terebene is also useful in this connection although it may disturb the stomach. It may be given in doses of five to ten minims (0.30 to 0.65) three times a day well diluted. If the cough, after examination, appears to be due to involvement of the larynx the measures described on page 677 are applicable.

Hæmoptysis is an important symptom. The patient should be kept absolutely at rest, in the recumbent position, but with the shoulders slightly raised. Cold applications should be made to the chest in the form of the ice coil, the ice bag or cold compresses wrung out in ice water, and the patient may be given bits of ice to suck. The early administration of a hypodermatic injection of morphine sulphate one-fourth to one-third of a grain (0.016 to 0.02) is usually advisable. All measures which increase the blood pressure should be avoided and if the arterial tension is high aconite may be given in doses of five minims (0.30) or more of the tincture every hour until the desired effect is produced. A very important measure is the administration of one of the salts of calcium in order to increase the coagulability of the blood. The most effectual of these is the lactate, next in order is the chloride, the former being from two to three times as potent as the latter. The initial dose of either is forty grains (2.50) and they afterward may be given in twenty grain (1.30) doses three times a day. The exhibition of the preparations of ergot, gallic and tannic acid and of the lead salts is probably useless. Supra-renal extract in doses of five grains (0.30) every two or three hours and the hypodermatic administration of three and one-half ounces (100.0) of a ten percent. gelatin solution at 110° F. (43° C.) are recommended; the latter, it is said, possesses hæmostatic properties and may be given also by mouth. The ordinary preparation, which may be found in every kitchen, may be taken dissolved in water in doses of two ounces (60.0) every two hours. Fortunately pulmonary hæmorrhage, in itself, is seldom fatal and tends spontaneously to become checked. In cases where the quantity of blood lost jeopardizes the life of the patient the limbs should be bandaged from the fingers and toes toward the body; enteroclyses and hypodermatoclyses of hot normal saline solution should be given to supply the loss. The treatment of hæmoptysis by means of inhalation of amyl nitrite has recently been much extolled and is apparently based upon reasonable principles

Sweating is often a distressing symptom, and numerous drugs have been employed in its control. An excellent method of relieving the night sweats which usually make their appearance during the early morning is to wake the patient at about four, and give him a tumbler of warm milk containing a little whiskey; this procedure has the additional advantage of supplying extra food. Aromatic sulphuric acid—fifteen minims (1.0) three times a day—camphoric acid—thirty grains (2.0)—given in powder or in spirits three hours before the sweat is expected may be prescribed for this symptom and in excessive instances a hypodermatic injection of one-fourth of a grain (0.016) of morphine sulphate with one one-hundredth of a grain (0.0006) of atropine sulphate is often effectual. Muscarine, five minims (0.30) of a one percent. solution, picrotoxin one-sixtieth of a grain (0.001), agaricin, one-fourth of a grain (0.016), and agaric acid in similar dose have all been recommended.

The diarrhœa of phthisis, before there is tuberculous inflammation of the intestine, may be controlled by bismuth subsalicylate or subnitrate, twenty grains (1.30) three times a day. Later in the disease larger doses may become necessary. If the diarrhœa is persistent a little opium may be given and better results may follow the use of bismuth tetraiodophenolphthaleinate—eight grains (0.5)—than are obtainable with the commoner bismuth salts. If the diarrhœa is the result of tuberculous involvement of the bowel it is likely to be persistent and, in addition to the above means, irrigations and larger doses of opium given with the salts of lead, silver or zinc, may be prescribed.

Tuberculin has been persistently employed as a therapeutic agent by a certain number of observers but has never been in general use. It is probably harmless if carefully used, and the earlier it is employed and the less general the infection the more likely will it be to achieve benefit. It is said to be contra-indicated if either fever or hæmoptysis is present. The preparation employed should be the tuberculin residuum or tuberculin R. which is potent to produce immunization and, if administered carefully, will cause no reaction. The initial dose is fifteen minims (1.0) of a solution of fifteen grains (1.0) of tuberculin R. in one pint (500.0) of normal saline. This solution should be freshly prepared—within twenty-four hours of the time of administration. A dose should be injected into the muscular tissues of the back every second day. If there results a rise of temperature the succeeding dose should be postponed until this has disappeared. The patient, after repeated injections, usually is able to take largely increased doses without reaction and with, perhaps, improvement in his condition.

In the light of our most recent knowledge it has become necessary to take into consideration the opsonic power of the blood when administering tuberculin and other such substances as a therapeutic measure. The opsonins are certain bodies which are contained in the serum of normal blood and



in whose presence the phagocytic power of the leucocytes over pathogenic micro-organisms in the blood stream is much more potent than when these bodies are absent. The term opsonic index has been employed to designate the relative amount of opsonins in the circulation, consequently a patient whose blood contains them in considerable quantity is said to possess a high opsonic index and *vice versa*.

Tests have shown that in the tuberculous the tuberculo-opsonic index is below normal. By comparing the resistance or opsonic power of a patient's serum with that of the serum of normal individuals it has been demonstrated that in all infectious processes times occur when the patient's resistance is on the increase and other times when it wanes. In the latter condition the introduction of bacterial vaccines corresponding to the infective micro-organism present still further lowers the opsonic index and the patient's power of resistance is correspondingly lessened. In view of this fact the immunizing substance should be given during the periods of high opsonic index, thus endeavoring to maintain the anti-bacterial power of the blood at as high a level as possible by observing the condition of the opsonic index and regulating the time and amount of dosage in accordance with its variations. Experimentation has shown that much smaller doses of "new tuberculin" than are usually given produce the maximum immunizing response without causing constitutional disturbance, and in consequence, a dosage equivalent to $\frac{1}{80000}$ to $\frac{1}{30000}$ of a grain ($\frac{1}{8000}$ to $\frac{1}{3000}$ of a milligram) of tubercle powder are recommended; such doses, when given corresponding to the rises and falls of the opsonic index and in connection with means calculated to increase the flow of blood and lymph through the diseased area, which latter aid in increasing the action of the antibodies upon the bacteria present, promise well and seem to imply that this method of treatment will prove a distinct advance in the combat against tuberculosis infection, particularly those forms which affect the bones, joints, and lymphatic system. It is also quite clear that the treatment is worthy of a careful trial in the pulmonary forms of the disease. It should be borne in mind that while theoretically the opsonic index is a most valuable aid in establishing dosage and frequency of administration of remedial agents the practical difficulty arises in its determination. Skill in laboratory methods and differences in personal equation vary so much that it is difficult to obtain even approximately the same report from a given specimen when examined by different observers.

Serum treatment, however, has not as yet given any results which justify its employment to the exclusion of other methods. Favorable reports have been published upon the use of the serums of Marmorek and Maragliano. Von Behring believes that he has found a method by the use of which he was able to permanently immunize calves and that he had succeeded in rendering the process applicable to human beings. The substance employed is an

attenuated culture of tubercle bacilli from which certain injurious elements are removed, transforming it into an amorphous state, in which condition it is directly absorbable into the lymphatics of the organism. This method of treatment is at present *sub judice*. In this connection Cheinisse is of the opinion that serum therapy has been the subject of a great number of communications, but the many disappointments which everyone has in mind make us skeptical, and the very multiplicity of "serums" and "new tuberculins" recommended in the treatment of tuberculosis is the best possible proof of the inefficacy of every one of these pretendedly specific remedies.

Tuberculosis of the Lymphatic Glands.

Synonyms. Tuberculous Adenitis; Scrofula; King's Evil.

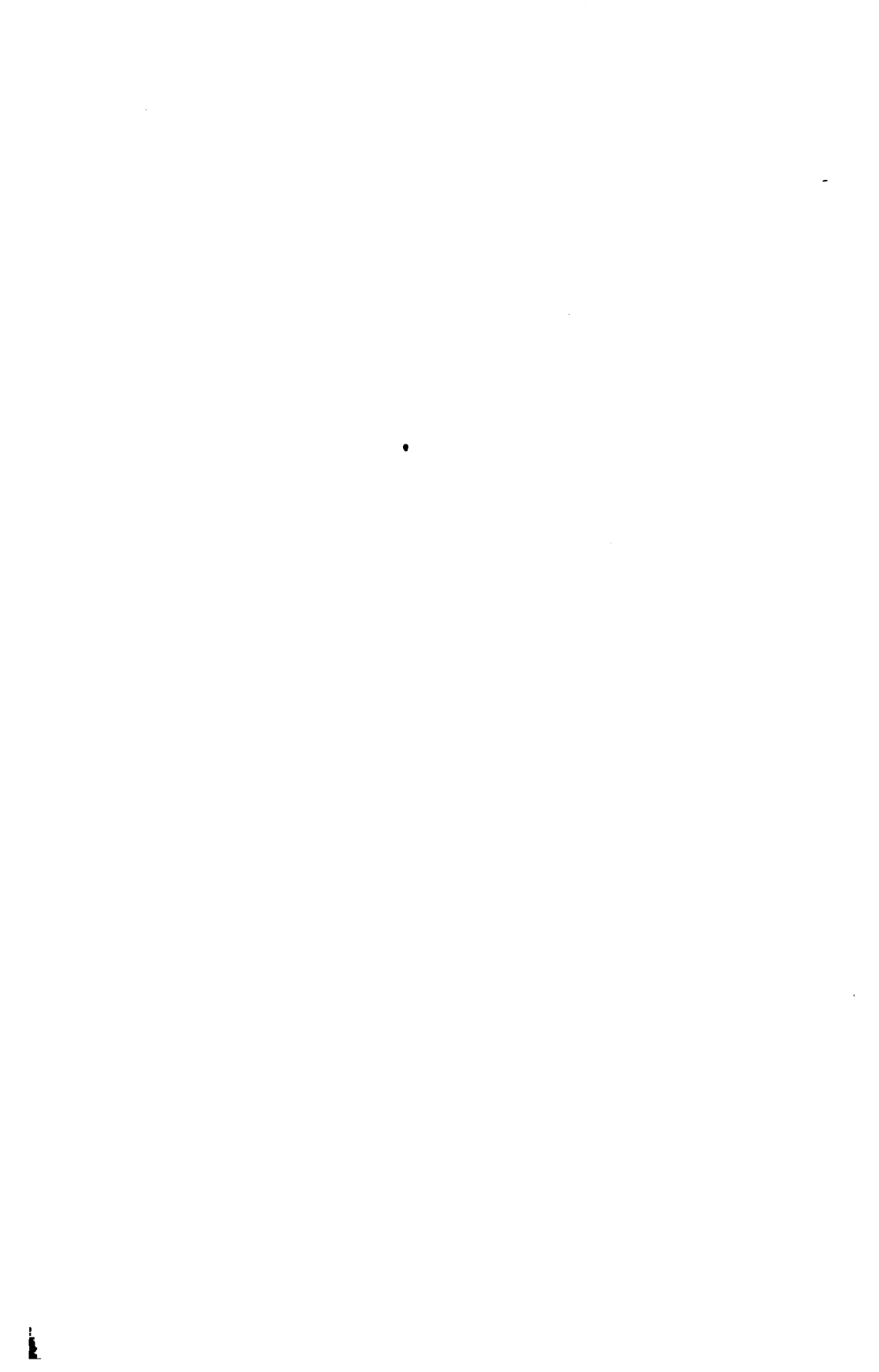
Ætiology. Tuberculous inflammation of the lymph glands may occur at any age but is most frequently met in children. All catarrhal affections of the mucous membranes are predisposing causes; the tubercle bacilli which find lodgment upon the diseased surfaces, being taken up by the lymph circulation and deposited in the adjacent lymph ganglia, explain the occurrence of involvement of the submaxillary and cervical glands in instances of naso-pharyngeal or tonsillar inflammations, of the bronchial and mediastinal glands after measles or whooping cough, and of the mesenteric glands as a result of catarrh of the intestines.

The specific cause of tuberculous adenitis is the *bacillus tuberculosis* of Koch.

Symptoms. The glandular involvement may be either general or localized. The former is rare but has been observed, and particularly in the colored race. The appearance resembles that of Hodgkin's disease, there being enlargement of the cervical, submaxillary, axillary, and inguinal glands with pain and tenderness, and *post mortem* examination reveals an analogous state of the bronchial, mesenteric, and other internal lymph nodes. There is a febrile movement, and death may take place from the pressure of the enlarged glands upon the bronchi or trachea, or from associated disease.

Enlargement of the bronchial glands is frequent in pulmonary tuberculosis; the condition may be so pronounced as to be recognized *intra vitam* or in less marked instances is not disclosed until after death.

Local tuberculous inflammation of the lymph glands is most frequent in those of the cervical region. It is common in children, especially those of delicate constitution and whose surroundings are unsanitary. It may follow the glandular enlargements which occur as a result of tonsillar enlargement, inflammations of the ear, and pediculosis or eczema of the scalp. The glands are at first firm in consistence and discrete, later they become matted together into a diffuse mass and finally they may soften and suppurate, and becoming adherent to the overlying skin, rupture externally and discharge their con-



tents. There is an irregular febrile movement, and the nutrition is seriously interfered with. In certain instances the glandular involvement extends to the lymph nodes beneath the clavicle, those of the axilla, and even to the bronchial ganglia; these last tend to undergo caseous degeneration rather than to suppurate. A unilateral inflammation of the axillary glands may be the precursor of a tuberculous involvement of the pleura or lung.

Involvement of the mesenteric or retro-peritonæal glands (*tabes mesenterica*) occurs as a result of tuberculous enteritis or primarily in simple catarrhal inflammations of the intestine. The latter form is especially common in children. The patient is emaciated and anæmic, the abdomen is prominent and tympanitic, and diarrhoea with foul-smelling movements is present. The febrile movement is moderate. Palpation reveals the presence of the enlarged glands, more rarely of tuberculous deposits in the peritonæum itself. Death takes place from intercurrent disease or from exhaustion.

In adults, *tabes mesenterica* is less frequent but may occur primarily or be secondary to pulmonary tuberculosis.

The tuberculous glands of the mesentery and those of the retro-peritonæal region tend rather to undergo cheesy and calcareous degeneration than to suppurate.

Diagnosis. Of tuberculous adenitis from Hodgkin's disease (lymph-adenoma) this is usually not difficult. In the former the glandular involvement is less likely to be general, the glands tend more to become massed together, to become tender and to suppurate, while in the latter they are more movable and less adherent to the surrounding tissues and the process is a more rapid one.

The examination of the blood will differentiate tuberculous glandular enlargement from that of lymphatic leukæmia and the glands of simple lymphoma are harder, more discrete, less tender, and less likely to become inflamed; likewise constitutional symptoms are absent. Malignant disease is more rapid in its progress and attended by cachexia and metastases if sarcomatous, while in carcinoma the primary growth to which the glandular enlargement is secondary can be usually found.

Prognosis. This is usually good, but that of *tabes mesenterica* is distinctly bad. Many instances of acute tuberculosis are said to result from the glandular form of the disease. General lymphatic adenitis, such as occurs in negroes, often results in death but usually from some intercurrent disease.

Treatment. This consists in the employment of the general measures, hygiene fresh air, feeding, tonics, etc., mentioned under the treatment of chronic pulmonary tuberculosis and especially the administration of iron iodide—fifteen minims (1.0); iodine, locally in the form of the tincture painted on, the compound iodine ointment or as six percent iodine-vasogen; all seem to have a certain influence in lessening the glandular enlargement. A ten

percent. ichthyol ointment in equal parts of lanolin and ointment well rubbed in is efficacious. A more convenient preparation is ten percent. solution of ichthyol in glycerin which should be painted on the skin over the enlarged glands each night. The internal administration of calcium hypophosphite in capsules, thrice daily in three grain (0.20) doses, has yielded excellent results. The prolonged use of codliver oil is also to be recommended.

Rather encouraging results have been reported from the Röntgen-ray treatment of tuberculous glands of the neck, and in the opinion of certain observers the prospect of success is sufficient to warrant the employment of this means. Suppurating glands should, however, be incised and evacuated; the sluggish sinuses which so often persist may be benefited by these applications which seem to stimulate the healing process.

The early surgical treatment of tuberculous glands consists in their removal by dissection, often a difficult and prolonged operation.

Tuberculosis of the Sexual Organs.

Tuberculosis of the testes, prostate gland, and seminal vesicles occurs as a caseous degeneration which seldom proceeds to liquefaction. Testicular tuberculosis is not rare and may be either primary or secondary to tuberculous disease of other parts, especially to tuberculosis of the seminal vesicles. It is seen in adults and in children and even in the foetus. The epididymis may be first invaded whence the affection spreads to the testicle itself; the organ is enlarged, later becomes softened and ulcerated, and fistulæ, the walls of which are infiltrated with tuberculous tissue, are formed. The condition may be mistaken for syphilis; both are painless, but the latter affects primarily the body of the testis in which are situated irregular nodules of a stony hardness. In prostatic tuberculosis the gland is nodular, the nodules being palpable upon rectal examination, there is vesical irritability, and catheterization is painful and difficult.

Tuberculosis of the tubes is the most frequent of these affections in women and may occur primarily. The diseased tube is enlarged, infiltrated and hard and contains mucus, pus, and caseous matter. Abscesses, followed by peritonitis, may occur. Both tubes are usually involved. Ovarian tuberculosis is usually secondary to tubal disease; the organ may be infiltrated with tubercles or caseous areas, which may form abscesses.

Uterine tuberculous disease is rare and may be primary; usually, however, it is secondary to disease of the tubes or vagina. The wall of the organ is infiltrated with tubercles and its mucous lining is thickened. The tubercles may undergo degeneration which results in ulceration and metritis, the symptoms of which differ in no way from uterine inflammation due to other causes.

Tuberculosis of the mammary gland may occur in either sex but is by far more common in women; it is most frequent between the ages of forty

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and sixty. Tubercles are formed in the glands; these degenerate and soften, breaking through the skin and form suppurating fistulas; in the walls and discharge of the sinuses bacilli may be found. The axillary glands may be enlarged. Cold abscesses of the breast may rarely occur.

The course of this disease in its various situations is usually protracted, but recovery is possible under proper constitutional, which has already been fully presented, and early and thorough surgical treatment.

Tuberculosis of other organs will be considered with the diseases to which they are subject.

ACUTE INFECTIOUS PNEUMONIA.

Synonyms. Croupous Pneumonia; Pneumonitis; Lung Fever; Lobar Pneumonia; Fibrinous Pneumonia.

Definition. An acute, infectious inflammation of the parenchyma of the lungs, with exudate and characterized by a chill, fever, dyspnoea, rusty sputum, and prostration.

Ætiology. Acute infectious pneumonia is common in all countries. It occurs chiefly in adults and is most frequently seen during the cold and damp seasons of the year. Males are more prone to the disease than females, probably because of the greater liability to exposure of the former. Alcoholism, debilitated conditions and exposure to cold and wet are predisposing factors. One attack is likely to predispose to another. At times the disease seems to occur epidemically.

The probable specific cause of the disease is infection by either the *micrococcus lanceolatus* or the *pneumococcus*, determined by Fränkel in 1884 to be the more frequent germ of this disease or the *bacillus pneumoniae* the pneumobacillus of Friedländer discovered in 1883 or both of these together. Streptococci, staphylococci, and various other micro-organisms may be found in pneumonic sputa as the result of a mixed infection. It seems to be the accepted idea at present that a number of different bacteria are probably capable of producing the disease.

Pathology. In lobar pneumonia the pathological anatomy may be divided into three stages.

- (a) Congestion or hyperæmia.
- (b) Red hepatization or exudation.
- (c) Gray hepatization or resolution.

The lower lobes are most frequently affected, but involvement of the upper lobes is not rare, and even the whole of one lung may become the seat of the morbid process. When the upper lobes are involved the disease is usually of severe type.

During the stage of congestion the lung is œdematous but not consolidated, and in the air spaces are leukocytes, red blood cells, fibrin, and epithelium. The vessels in the walls of the alveoli are distended. The small bronchi

undergo a like change, but the larger bronchi may or may not be involved. The pleura as a rule remains normal. The first stage usually lasts only a few hours but may continue throughout several days.

When the first stage has reached its height the air spaces and bronchi which are the seat of the inflammation are filled with its products and the lung becomes solid, the stage of red hepatization. The air vesicles, spaces, and bronchi are plugged with the red blood cells, leukocytes and fibrin, but

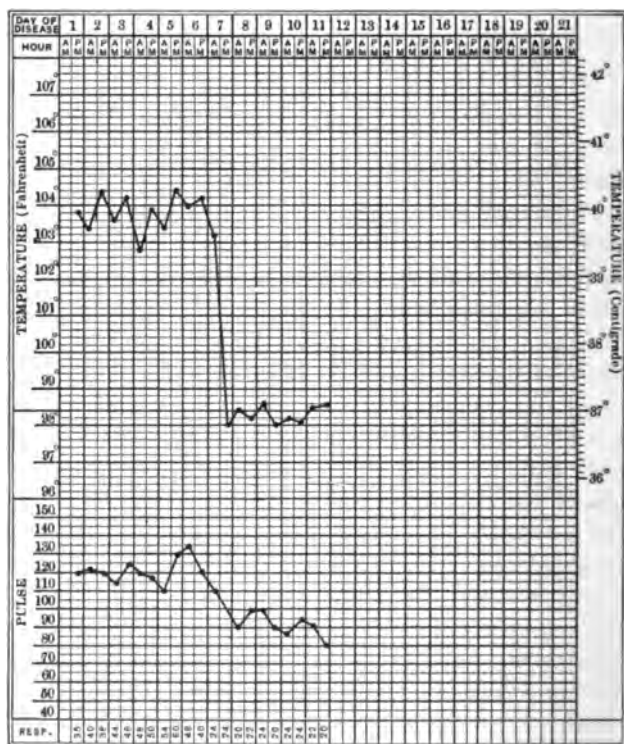
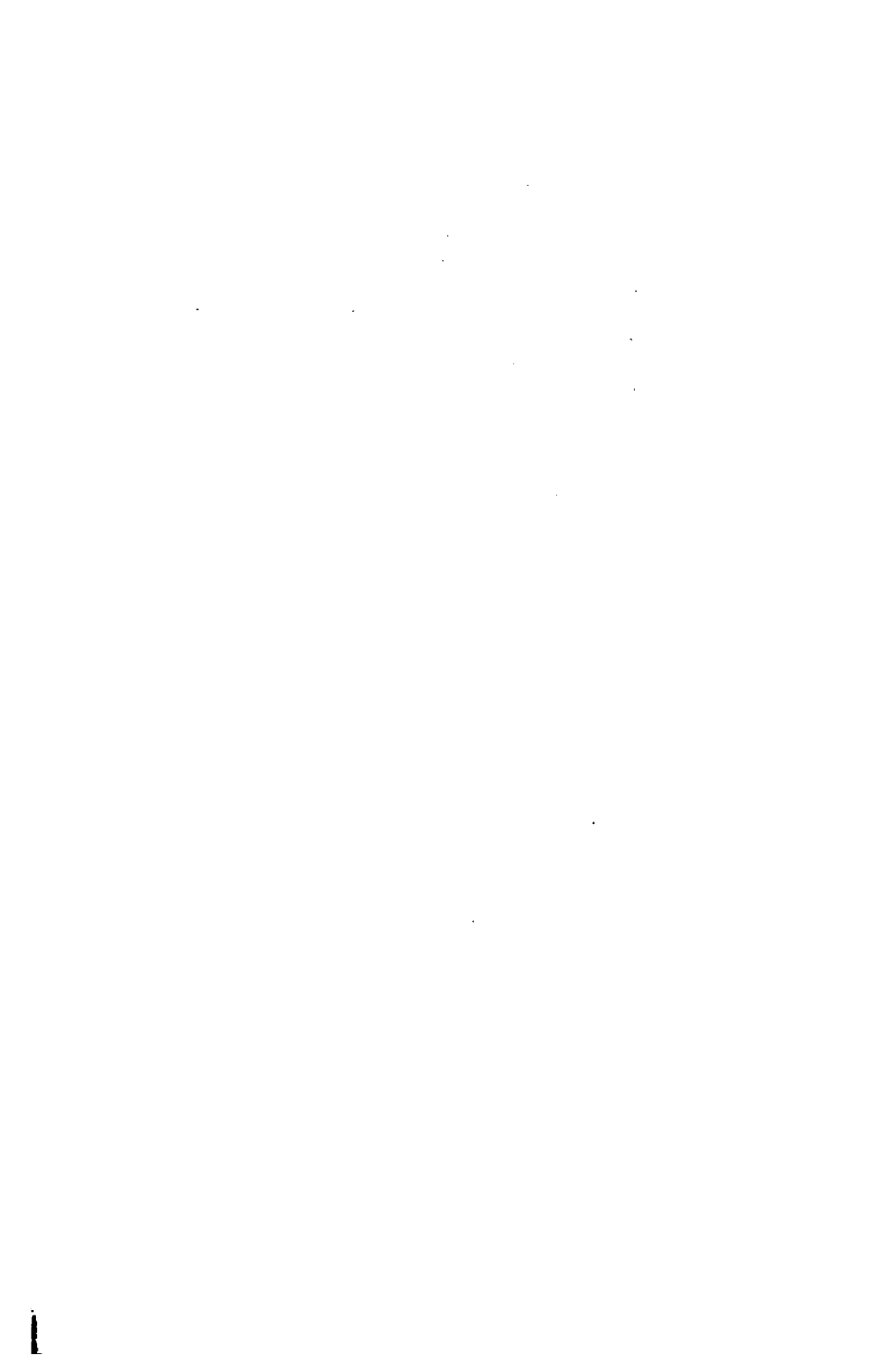


FIG. 7.—Clinical chart of acute infectious pneumonia.

the vessels of their walls are not rendered impervious. The pleura over the affected lobe is the seat of a fibrinous pleurisy. The solidified lobe is enlarged so that it may interfere with the action of the other lobes; about twenty-five percent. of the fatal instances die in this stage from one to ten days after the onset of the disease.

After the air spaces have become filled and the lobe is solidified the third stage ensues. The inflammatory material becomes gray in color and softened. The lung remains solid. If the patient recovers the exudate continues to soften and disintegrate, the stage of final resolution begins and the



lymph circulation carries off the inflammatory products. Resolution should begin when the temperature falls to normal and should be completed in a few days. The stage of transition between red and gray hepatization takes place between the second and eighteenth days of the disease. About fifty percent. of the fatal instances die in this stage.

If perfect recovery takes place the lung is restored to its original condition.

Symptoms. In a certain number of patients there are prodromata such as chilliness, slight fever, general malaise, and a sense of oppression, due probably to a lengthened first stage or period of congestion, but in a great proportion of instances, practically always, the disease is ushered in by one or more distinct chills. The temperature immediately rises and continues elevated, with morning remissions until defervescence. Sudden rises in temperature during the course of the disease usually mean an extension of the inflammation or the onset of a complication. When the inflammation affects the upper lobes the temperature is likely to be especially high. Certain patients, especially old persons, show very little rise of temperature, but this does not by any means indicate a mild attack.

Defervescence usually takes place by crisis on the seventh day, but may occur earlier or later, crises on the fifth, ninth, or eleventh days being not rare. In other instances, and this is especially true of pneumonias of the last decade, the defervescence takes place by lysis—this being particularly likely to occur in the pneumonia complicating epidemic influenza—the fall to normal extending over a number of days.

The pulse is at first full and rapid, later becoming weaker as the heart is embarrassed by the obstruction to the passage of the blood through the lungs and by the lack of oxygen due to the diminished respiratory surface.

The respiration is rapid and shallow and, as the disease progresses, varies with the amount of lung involved; the inspiration is short and may be accompanied by a grunting sound. The normal pulse-respiration ratio (four to one) is disturbed, a ratio of two pulse beats to one respiration being not infrequent. The respirations often are from forty to sixty per minute. Very labored breathing, generally with cyanosis, indicates large involvement of pulmonary tissue, marked congestion, severe bronchitis, tendency to heart failure or inflammation of the pleura or pericardium.

With the onset there is usually sharp stabbing pain in the chest increased on coughing or inspiration, which may be due to pleuritic inflammation.

Cough may be an early symptom or appear later in the disease. In the aged, especially, it may be absent. The sputum is a blood stained muco-pus, (the so-called "rusty sputum") and very viscid, so much so that it adheres tenaciously to the sides of the containing vessel. In severe infections the sputum may be thin and dark colored—"prune juice"—and large in quantity.

As resolution takes place the sputum becomes lumpy and yellowish or greenish. In certain patients and not infrequently in old persons there may be no expectoration.

From the onset the prostration is marked, the face assumes a characteristic expression of anxiety, and there is usually a deep flush over the malar bones, often only on the side of the disease. Herpes labialis is not rare, and cyanosis of the lips and extremities may occur when there is marked obstruction to respiration.

At the invasion there are often nausea and vomiting; the tongue is moist and coated. In severe infections it becomes dry, brown, and cracked.

Headache and general pain are common early symptoms. In severe types of the disease delirium and stupor are often seen. In alcoholic patients the infection is especially virulent and is usually accompanied by marked delirium, often by delirium tremens.

The urine is scanty, hyperacid, and diminished in quantity. It may contain albumin and casts, and its chlorides are diminished or even absent altogether.

A distinct leukocytosis is a feature of this disease.

Physical signs. Inspection. First stage: Respiratory movement is likely to be diminished on account of pain. *Second stage:* The normal side of the chest moves as in health, movement in the affected side is diminished. If both lower lobes are involved the movement of the diaphragm is interfered with and the respiratory movement is most apparent in the upper part of the chest.

Palpation. First stage: The vocal fremitus is slightly increased. *Second stage:* The vocal fremitus is distinctly increased as a rule, rarely diminished or absent, probably due to occlusion of the bronchi by inflammatory products.

Percussion. First stage: Usually the note is unchanged, but it may be higher in pitch, shorter in duration and less distinctly pulmonary in quality. *Second stage:* The note is now more or less dull, though it may be flat, tympanitic, or even cracked-pot. If the pleural cavity contains fluid, over this the note will be flat.

Ausculation. First stage: The respiratory murmur may be harsh or diminished. Crepitant râles are heard often only on deep inspiration followed by cough. There may also be subcrepitant râles due to the exudation into the small bronchi and coarse râles with sibilant and sonorous breathing due to inflammation of the larger tubes. *Second stage:* In most patients both voice and breathing over the consolidated lobe are bronchial but there may be bronchial voice without bronchial breathing or both voice and breathing may be absent. *Third stage:* As resolution progresses the breathing becomes broncho-vesicular, and subcrepitant and coarse râles in the bronchi are heard, due to the presence of the softened products

of the inflammation. The crepitant râle is likely to be again heard at the onset of resolution. As resolution continues normal vesicular breathing becomes more apparent and the percussion note approaches near to pulmonary resonance. The dulness is the last of the physical signs to disappear, often remaining to a slight extent long after the patient has recovered.

Clinical Varieties. These must be kept in mind to ensure greater accuracy in diagnosis and more exact indications for treatment.

Apical pneumonia is likely to be more productive of cerebral symptoms and greater prostration. The area involved may be slight and symptoms insignificant.

Creeping or migratory pneumonia successively invades other portions often without resolution in the parts previously infected; it is common in the influenzal type.

Massive or fulminating pneumonia offers no physical signs excepting flatness; the exudate fills alveoli, bronchioles, and bronchi.

Central pneumonia gives rise to many errors because the physical signs are not demonstrable often for several days.

Infantile pneumonia is marked by convulsions, and other cerebral symptoms, later followed by coma suggesting meningitis.

Senile pneumonia may not set in with a chill, temperature may not be elevated, cough and expectoration often are slight.

Alcoholic pneumonia is often unsuspected since pain, cough and expectoration may be absent and dyspnoea is slight. It may be confounded with delirium tremens or the latter condition complicate it.

Terminal pneumonia is often encountered in many other infectious diseases.

Ether pneumonia is less frequent now that more attention is given to anæsthesia, the patient properly protected during operation, and the time of it shortened. Surgeons should keep this in mind so that proper treatment may be instituted. The physical signs are generally marked.

Complications. Of these *pleurisy* is the most common, indeed it occurs whenever the pneumonic process reaches the surface of the lung and accordingly is so frequent as hardly to deserve the dignity of being numbered with the complications. To it is due the severe pain of the early stages and it is evidenced by the typical friction sounds, which, however, may be obscured by the other physical signs present. Effusion of serum into the pleura is not rare and may go on to empyema, in the pus of which pneumococci are usually found; in infrequent instances streptococci may be present. Purulent fluid is accompanied by a septic temperature with rigors and sweats and an increased leukocytosis. The physical signs are those of fluid in the pleural cavity. If there is doubt the use of the aspirating needle is justifiable.

Abscess and gangrene are rare complications. In these cases crisis does

not occur and the serious symptoms, marked prostration, continued high temperature do not abate. The expectoration of pus or the foul odor of gangrene establish the diagnosis. Still more rarely resolution does not take place and tuberculosis supervenes.

Pericarditis is occasionally observed and is easily overlooked; the fluid is usually of small quantity and serous in most instances; rarely it may be purulent.

Endocarditis is not very rare and is of the malignant type. It is especially likely to occur if there has been previous disease of the heart. The physical signs may be absent but if the temperature persists and becomes of septic character, if signs of embolism appear, or if a cardiac murmur develops, involvement of the heart should always be suspected.

Meningitis is a serious but not very common complication. The most usual time for its appearance is while the fever is at its highest and it may not be recognized, being masked by the cerebral symptoms of the disease. Endocarditis may be co-existent and, as a result of this latter, there may be cerebral embolism with its accompanying symptoms.

Complications which are infrequently met are neuritis, jaundice, which may be either hepatogeneous or hæmatogenous, parotitis, thrombosis of the peripheral veins, usually those of the leg, and peritonitis. In children otitis media is not uncommon and even mastoiditis is occasionally encountered.

In considering the complications of pneumonia that form of the onset of the disease which is marked by *abdominal pain* may be mentioned. In some instances the symptoms referable to the lung, if present at all, are wholly subordinate to severe pain in some part of the abdomen. If this occurs in the appendiceal region inflammation of the underlying structures may be suggested, but an exploratory incision will reveal nothing to account for this symptom. The pain may also be localized near the navel or deep in the epigastrium and suggest hæmorrhage into the pancreas.

Diagnosis. This is easy when the physical signs are typical, pleurisy with effusion being more usually mistaken for pneumonia than any other disease. In the latter condition, however, vocal fremitus is increased, while in the former it is absent and the constitutional symptoms are much less severe. The aspirating needle may be used if necessary. In pneumonia there is an increased leukocytosis, while in pleurisy, unless the fluid is purulent, this is not the case. Pneumonic sputum usually contains the specific micro-organism of the disease which will aid in the differentiation from tuberculous conditions. Typhoid fever, because of the associated bronchitis, is sometimes mistaken for this disease. Physical signs leave little opportunity for error. The hypostatic congestion of typhoid is a late manifestation but consolidation takes place early in pneumonia.

Prognosis. This should be guarded, the outcome of the disease depend-

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ing in great measure upon the age of the patient, his previous condition, and upon the extent of lung affected. Involvement of the upper lobes is considered more serious than that of the lower. Death usually takes place as a result of cardiac failure or of one of the complications, meningitis and endocarditis being particularly likely to cause a fatal termination. Later causes of death are abscess, gangrene, and terminal tuberculosis. Under the treatment to be described the mortality should be lowered to about five percent. excluding habitual alcoholics.

Prophylaxis. Pneumonia has recently become classified as one of the infectious diseases, consequently all discharges, especially the sputum, which may contain the contagium, should be treated as is usual in infectious conditions, and, as an additional precaution, rooms which have been occupied by pneumonia patients should receive proper fumigation before being again occupied. Cleanliness on the part of the nurse and physician should also be maintained as strictly as in the handling of the more virulently contagious diseases.

Treatment. From the onset of the disease the patient should be confined strictly to bed and not allowed to rise for any consideration, sudden paralysis of the heart having been known to occur as a result of even so slight an exertion as merely sitting up in bed. The patient should wear a flannel night gown or shirt which should open in the back to facilitate examination of the chest. The room should be large, light, well ventilated and kept at a temperature of from 65° to 70° F. (18.3° to 21.1° C.). The open-air treatment of this disease has been proposed and to some extent carried out on the same lines as that in tuberculosis. The conditions and duration of the disease are so different that the proposition is not very convincing. A limited experience was that it was without definite advantage. It is true, however, that restlessness and delirium were less in patients kept out of doors so that they required less attention. At the commencement of the disease calomel should be administered, followed by a saline, and throughout the infection the bowels should be kept freely open.

Medicinal treatment should be directed (1) toward limiting the infection, (2) toward overcoming the mechanical disadvantages; (3) toward the elimination of the products of the bacterial cause of the disease.

In the exhibition of creosote carbonate we have a means of limiting the infection, as proved by the statistics of various authorities. This drug cuts short or aborts a large percentage of instances, mitigates almost all the rest, and in a very small proportion of patients no result is obtained. Certainly if the early appearance of the crisis is any indication of the value of the treatment this remedy is deserving of a trial. Unlike creosote itself the carbonate is not disturbing to the kidneys or stomach even when administered for considerable periods of time. The usual dose is from two to six drachms (8.0 to 24.0) daily, the dose interval being six hours, but to a vigorous man

as much as one-half a drachm (2.0) every two hours may be given. It may be given in milk, sherry, or pure. The medication should be continued until the temperature has remained normal for four or five days, but when the febrile stage is past the dosage may be reduced one-half.

The mechanical obstruction to the circulation is best combated by the use of nitrites (glyceryl nitrate or sodium nitrite). These relieve the high tension in the pulmonary circulation to a slight extent and that of the systemic circulation markedly.

Of late erythrol tetranitrate in doses of one-half grain (0.030) every four to six hours has given more even and controllable effects than the evanescent glyceryl nitrate or the uncertain sodium nitrite. Hypodermatic stimulation by strychnine nitrate or sulphate in doses of from one-fiftieth (0.0012) even to one-tenth of a grain (0.006) every four to six hours may be employed as indicated, and continued until the desired result is obtained. The heart should be carefully watched for signs of dilatation and when these—weakness of the pulse and of the second pulmonic sound—appear the stimulation is necessary. Care should be taken not to mistake the appearance of deferescence for threatened cardiac weakness, for at the crisis the second pulmonic sound loses its booming character on account of the lessening of the tension in the pulmonary circulation consequent upon beginning resolution. The temperature chart gives the correct interpretation.

Alcohol as a stimulant should usually be confined to patients accustomed while in health to it. The amount given should be gauged by the patient's condition and may even reach a quart (litre) per day. Ammonium carbonate in ten grain (0.65) doses, in two ounces (60.0) of milk every two hours, replaces the strychnine in the aged. Excellent results are claimed for and obtained by veratrum viride in the very early stages of the disease occurring in young or even middle-aged individuals, but unfortunate results are quite as frequent as successes with this drug and it is to be employed exceptionally only. Its use should be confined to robust individuals. To bleeding the same remarks, though perhaps more stringently, will apply. It is also well known that venesection does not give as good results in pneumonia as in cyanosis, with dilated right heart due to other causes. This observation leads us to question as to how much the pressure in the pulmonary artery is raised by extensive pulmonary consolidation.

Toward elimination of the products of the bacteria causing the disease we can do much by means of high rectal irrigations of normal (0.9 percent.) saline solution, one gallon (4 litres) at 112° F. (44.4° C.) given twice daily. It is particularly potent in patients with complicating renal disease. It is a most valuable method of provoking diuresis, stimulating the heart, cleaning the large intestine and, to a less extent, producing diaphoresis. One-sixth of a grain (0.010) of calomel every hour for six doses, with saline laxatives sufficient to empty the bowels completely and keep them open afterward, with



from three to six grains (0.2 to 0.4) of zinc phenolsulphonate every two to four hours, may be administered with benefit. When the odor has disappeared from the stools the zinc salt should be given in doses just sufficient to prevent foetor and, if constipation occurs, a second course of calomel followed by a saline may be prescribed until the stools are odorless. It is true, however, that under the creosote treatment tympanites is rare and the necessity for intestinal disinfection is much lessened.

Oxygen is of value if the respiratory surface is much decreased and its inhalation is advocated by many as a valuable curative measure. It gives ease to the patient, relieves the cyanosis, the failing heart and the laboring respiration, and may induce sleep. That which contains a trifling amount of nitrous monoxide gas is more agreeable to the patient in that the mouth does not become so dry under its use. The best method of administering it is to arrange a funnel attached to the container in front of the patient's nose and mouth. It must be given for considerable periods at a time and to some patients incessantly. Certain observers advocate its intermittent use from the beginning of the disease on the ground that it is likely to ward off respiratory failure.

Expectorants when necessary may be prescribed, the preference to be given to apomorphine hydrochloride one thirty-second of a grain (0.002) every four hours.

Acute infectious pneumonia in the aged is a very serious disease on account of the tendency of old persons to heart weakness and pulmonary stasis. Free stimulation is likely to be necessary and the patient should be turned from one side to the other several times a day. It is the author's custom, when the stomach will bear the drug, to administer ten grains (0.65) of ammonium carbonate in two ounces (60.0) of milk from three to six times a day to these patients.

Local applications which interfere with the patient's comfort are to be avoided. A pneumonia jacket of cotton batting overlaid by oiled-silk is pleasing to many and, if pleuritic pain be present, a layer of cataplasma kaolini spread on the chest, a square of thin muslin intervening, and covered with layers from a roller bandage often affords relief. A liniment of equal parts of menthol, hydrated chloral and camphor well rubbed in at the seat of the pain is also useful. In very marked pleuritic pain hypodermatic injections of morphine sulphate may become necessary.

The headache and delirium may be mitigated by the use of the ice cap. The high temperature is relieved by sponging the patient, one part at a time, with equal parts of alcohol and water. The rigorous hydropathic measures have but little influence upon either the severity or the duration of the disease. Considerable experience in their use and analysis of the results obtained led to their abandonment. Under the creosote treatment the fever is of short duration and the high intestinal irrigations eliminate toxins, so that with this treatment there is little reason for their use.

Treatment by means of an antitoxin has been extensively attempted, but the results, as a whole, fail to carry conviction. An efficient serum, or one which will shorten the disease, has not yet been elaborated, but in the opinion of certain observers the serums at present available have a limited use. The results so far attained by the use of treatment by antitoxin have modified the mortality to scarcely a sufficient degree to warrant its universal employment. The serums thus far elaborated possess no antitoxic qualities and that they possess anti-infectious properties has yet to be proved. Notwithstanding the discouraging results attained up to this time in the attempt to discover a potent treatment for pneumonia along this line, further research is to be encouraged.

Diet. Milk, preferably peptonized or diluted with Vichy or lime water, or the fermented milks, koumys or matzoon, should be our chief reliance. The preparations of the meats in the form of extracts may be allowed.

Taking all into consideration the treatment of pneumonia is especially satisfactory. In fine we should rely upon: 1. The continuous persistent and generous administration of creosote carbonate. 2. Careful adjustment of mechanical conditions. 3. Thorough evacuation of toxins by all possible means. 4. Temporary supplemental oxygen by inhalation. 5. Liquid diet until all physical signs disappear.

BRONCHO-PNEUMONIA.

Synonyms. Catarrhal Pneumonia; Capillary Bronchitis; Lobular Pneumonia.

Definition. A disease of the lungs caused by microbic infection and characterized by areas of consolidation of varying size scattered through the lung, each surrounding a bronchus.

Ætiology. It is this form of pneumonia which occurs most frequently in children, either as a primary disease or as an inflammation seated in atalectatic lobules; it is also prone to attack the aged.

The disease may occur primarily as a result of exposure; especially is it predisposed to by catarrhal affections of the air passages and particularly by the presence of adenoids and enlarged tonsils.

Secondarily, broncho-pneumonia occurs as a complication of the acute infectious diseases particularly those to which children are prone, measles, scarlet fever, diphtheria, and whooping cough, which accounts for the numerous instances of the disease during the early years of life. It may occur secondary to bronchitis in adults as well as in infants and, in the former, especially in old age, it may complicate the infectious diseases and various chronic affections such as nephritis and endocarditis.

The so-called foreign-body or inhalation pneumonia is a variety of broncho-pneumonia; this type of the disease is caused as follows: In comatose

Title

Catarrhal Pneumonia

Broncho - pneumonia.

Symptoms.

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states or when for any other reason the sensibility of the glottis is impaired, particles of food or drink may pass into the trachea and thence into the smaller bronchi where they cause irritation, subsequent inflammation, and even suppuration and gangrene. Inhalation pneumonia may follow operations upon the pharynx or larynx, and the inhalation of particles of blood clot raised during hæmoptyses; it may occur in individuals whose occupations necessitate the respiration of air impregnated with dust, such as coal miners, stone-cutters, etc.

Poor hygienic surroundings and poor sanitary conditions predispose to the incidence of broncho-pneumonia.

The micro-organisms most often associated with broncho-pneumonia are the *streptococcus pyogenes*, *staphylococcus albus* and *aureus*, the *pneumobacillus* and the *micrococcus lanceolatus*. The diphtheria bacillus also may be found if the affection is secondary to diphtheria. The influenza bacillus is by no means a rare cause. Mixed infections are the rule.

Pathology. The surface of the lung, if the areas of consolidation reach the surface of the organ, shows prominences, over which the pleura may be the seat of a fibrinous exudation, and depressions of darker color; the latter representing collapsed lung which may, however, be re-inflated. Other parts of the lung may be the seat of a compensatory emphysema. The projecting areas represent consolidation. These are firm and may be small, consisting of a zone of inflamed tissue surrounding a single bronchus, or large as a result of the coalescence of several such areas. Cross section of the consolidated zones reveals a central spot of lighter color from which pus may be expressed; this is the bronchus the lining of which is the seat of an exudative inflammation. Microscopically the exudate in the consolidated portions of lung is seen to be composed of fibrin, pus and red blood cells and epithelium. The bronchial mucous membrane is swollen and infiltrated with leukocytes; its lumen is blocked by an exudate of mucus, pus, and exfoliated epithelial cells. The air cells adjacent to the areas of consolidation are dilated and emphysematous. In adults a later stage of the consolidation may resemble in appearance the gray hepatization of infectious pneumonia and it may finally undergo permanent sclerosis. In inhalation pneumonia the inflammatory process is more pronounced and may be followed by abscess formation or gangrene.

The pneumonic process may terminate in resolution, chronic interstitial broncho-pneumonia (sclerosis of the lung), suppuration or gangrene, or a secondary infection with the tubercle bacillus may take place, leading to acute or chronic pulmonary tuberculosis.

Symptoms. In the primary form of the disease the onset may be sudden, with a chill, which may be unnoticed, or a convulsion, but more commonly the invasion is gradual with cough, increasing dyspnoea, and a rise of temperature. In the secondary type we usually have the symptoms of the pri-

mary affection and a cough to which a febrile movement is added— 101° to 104° F. (38.5° to 40° C.). The cough becomes more marked, the pulse rapid and the respiration increased—forty to sixty or even higher—there is dyspnoea and often cyanosis of the face and extremities. As the disease progresses the cough becomes less frequent, but the pulse and respiration remain accelerated, the former growing gradually weaker, until death occurs from failure of the right heart. In more favorable instances after a few days the symptoms abate and recovery takes place. Convulsions may occur as a late symptom.

In adults the onset varies but is usually gradual, with cough, rapid pulse, dyspnoea, and fever. The diagnosis is usually impossible without physical examination. In inhalation pneumonia the invasion is prolonged and the development of the symptoms slow.

Physical Signs. In certain instances the areas of consolidation may be too small to give distinctive physical signs. Here at first we may have the coarse râles of a general bronchitis, and over a certain part of the lungs, usually in one of the lower lobes posteriorly, coarse sonorous and finer sibilant râles are heard which are soon replaced by fine moist subcrepitant râles with an enfeebled and high pitched respiratory murmur. Larger areas of consolidation give the moist subcrepitant râles which, directly over the solidified portion of the lung, are louder and seem closer to the ear. Here the respiration is higher pitched and broncho-vesicular. The voice is also of increased resonance. The percussion note and vocal fremitus are often unchanged but, if the consolidated zones are of considerable size, slight dulness may be apparent and perhaps slight increase in fremitus. At the center of the solid area the voice and breathing are bronchial, becoming less typically so as the margin of the consolidation is approached. The râles are often absent over the point of maximum consolidation but become more frequent at a distance from this situation. When resolution begins the bronchial voice and breathing are the first to disappear; râles may persist for several weeks. It must be remembered that frequently ordinary respiration will not suffice to render the physical signs perceptible; the child must be made to take deep respirations or to cry. In old persons the signs are analogous to those in children. When the consolidation involves but a small portion of the pulmonary tissue there may be no sign but fine moist râles. In larger areas of solidification the signs are more marked.

Diagnosis. In children this may be easily made, especially in the secondary instances of the disease, for a cough, fever, rapid pulse and respiration, with the occurrence of the fine moist râles over a portion of the lungs signify broncho-pneumonia and nothing else, but if the consolidated area is large and the physical signs bear a close resemblance to those of acute infectious pneumonia the differentiation from the latter affection may be

difficult. In infectious pneumonia the temperature is likely to be persistently high while in broncho-pneumonia it is frequently remittent.

Prognosis. This is always serious in children, but depends to a great extent upon the previous condition and upon the primary disease if the pneumonia is secondary. In private, the patient's chances are far better than in hospital, practice. Young infants are more likely to perish than those over one year of age. Patients who take nourishment and assimilate well are likely to recover, but those who suffer from digestive disturbances less commonly do well. Convulsions in the latter part of the disease are a serious symptom. Even in children the disease may go on to pulmonary tuberculosis.

In severe infections death may take place within twenty-four hours; in favorable instance the disease lasts a week or ten days and is followed by a convalescent period of similar duration.

Treatment. Prophylaxis consists in careful treatment and care for all instances of catarrhal affections of the upper or lower air passages, the removal of adenoids and enlarged tonsils, careful nursing during and avoidance of exposure after all acute infectious diseases, and the isolation of broncho-pneumonia patients, when the disease breaks out in hospitals.

The patient should be kept in bed, unless he is small enough to be held in the nurse's arms for some time each day, in a thoroughly ventilated apartment—one with an open fire-place is best—and it is wise to remove him to another room at least twice during the twenty-four hours, while the sick-room is aired. The food should be entirely of liquids and chiefly of milk. If the child is receiving a modified milk mixture it is well to dilute this with equal parts of water during the acuity of the illness.

At the onset the bowels should be opened by calomel—one-tenth to one-fourth of a grain (0.006 to 0.016) of calomel at half-hour intervals until six doses have been taken.

Poultices or blisters should not be applied, the application, however, of a mild mustard paste, of a strength of one part mustard to six of flour with lukewarm water and put on while warm, is advised. This should be large enough to cover the whole chest, should be applied every two to four hours and allowed to remain in place until the skin is well reddened, not blistered. If fever is absent the pneumonia jacket of cotton batting laid between muslin and oiled-silk, the former being placed next the skin, may be worn but if the temperature is elevated this is best omitted.

The cough may be relieved and the bronchial secretion rendered less tenacious by steam inhalations which are given by means of a croup kettle, the spout of which is passed into a tent made of blankets and arranged over the crib. Either water alone or lime water may be employed in the early stages; later creosote, eucalyptol or compound tincture of benzoin may be added. Each inhalation should last about a quarter of an hour and these may be given as many as ten times daily, depending upon the patient's condition.

It is very important that the digestion remain undisturbed, consequently the less medication given by mouth the better; however, we often prescribe creosote carbonate with benefit. A child of two years may take three or more minims in a spoonful of milk every three hours. If expectorants are deemed necessary, and this is seldom the case, to older children in the first stage we may give antimony and ipecac in minute doses and later one of the stimulating expectorants. The following prescriptions may be useful: *R*, vini ipecacuanhæ ℥ij (8.0), vini antimonii ℥j (4.0), vini xerici, ℥iij (12.0). *Misce et signa.* Ten drops every two hours for a child two years old. *R*, ammonii chloridi, gra. x (0.65), spiritus camphoræ, ℥j (4.0), spiritus ætheris nitrosi, ℥ij (8.0) syrupi tolutani ℥iij (12.0), aquæ gaultheriæ, aquæ destillatæ, āā q. s. ad ℥iij (90.0). *Misce et signa.* One teaspoonful every hour for a child two years old. Too much stress cannot be laid upon the danger of the indiscriminate administration of expectorants and emetics to children. Emetics are allowable only when the secretion is profuse and the cough insufficient to relieve the bronchial tubes; here we may employ the syrup of ipecac in dose of one drachm (4.0) for a child of two years. Emetics are strictly contra-indicated in severe infections with depressed circulation.

If the cough is distressing small doses of pulvis ipecacuanhæ et opii with the addition of acetphenetidīnē (phenacetinē) if there is high temperature and restlessness—one-half of a grain (0.03) of the former and one grain (0.065) of the latter—may be given to a child of two years. To younger children these drugs should be administered with great care on account of their depressing influence upon the heart and respiration and the constipating effect of the opium. Heroine is useful in older children to relieve the cough, the dose for a child of five years being from one one-hundredth to one-sixtieth of a grain (0.0006 to 0.001).

Tincture of aconite in doses of two minims (0.13) may be given in the early stages of the disease every two hours, when the pulse is full and bounding, until its effect is noted.

Stimulation is necessary as soon as there is any evidence of circulatory weakness, and here our chief dependence must be placed upon alcohol, in the form of brandy or whiskey, and strychnine; twenty drops (1.30) of either of the two former may be given to a patient of from one to two years old every two hours. It should be well diluted with water and the dosage may be increased if necessary. The dose of strychnine sulphate for a child of two years is one two-hundredth of a grain (0.0003) every two or three hours.

Attacks of respiratory failure should be combated by full doses of strychnine and atropine and the administration of oxygen inhalations. The child may be made to cry, which will cause fuller inspirations of air and freer oxygenation of the blood, by continued spanking or the employment of alternate hot and cold applications of water to the chest; a hot mustard bath is useful in collapse. The repetition of these procedures is often necessary.

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Nervous symptoms, restlessness, sleeplessness, etc., may be relieved by small doses of acetphenetidine, and if the fever reaches 105° F. (40.5° C.) or over, cold sponging is useful.

During convalescence tonics, especially codliver oil and the syrup of iron iodide, should be prescribed, and in instances of persistent cough small doses of creosote carbonate are very useful. It may be necessary to complete recovery to prescribe a change of climate.

The treatment of the broncho-pneumonia of adults is essentially the same as that of acute infectious pneumonia (*see* p. 203). Inhalation pneumonia is usually secondary to other serious disease and while the general treatment is that of broncho-pneumonia, the results are not all that might be desired.

CHRONIC INTERSTITIAL PNEUMONIA.

Synonyms. Sclerosis of the Lung; Cirrhosis of the Lung.

Cirrhosis should be abandoned in favor of sclerosis since there is a change in density and not in color of the organ.

Definition. A chronic inflammatory affection of the lung characterized by an over-growth of fibrous tissue which replaces the normal pulmonary parenchyma. This interstitial change may be either local or diffuse, according as to whether it involves small or large areas of the lung tissue.

Ætiology. This disease is chiefly a secondary affection and occurs with nearly all chronic pulmonary inflammations. In tuberculosis, the fibroid phthisis (*see* p. 177) which at times results, is a form of interstitial pneumonia. It also frequently follows a broncho-pneumonia even in children, very rarely does it succeed an acute infectious pneumonia. Chronic interstitial pneumonia occurs as a result of the inhalation of dust by those whose occupations necessitate working in a dust-laden atmosphere. It may be caused by any of the tumors and cysts which may involve the lung and may be induced by pulmonary abscess. Chronic fibrinous pleurisy or pleurisy with effusion may so compress the lung as to lead to fibroid change and the same degeneration follows compression by aneurysmal tumors and the irritation caused by the presence of a foreign body. Microbic infection, in addition to mechanical influences, bears a distinct relation to the production of interstitial pneumonia.

Pathology. The affected lung is shrunken and much retracted within the thoracic cavity, and displacement of the heart is usually observed if the affection involves the left lung; pleuritic adhesions are common. On section the lung is dense and firm and of grayish color due to the presence of the fibrous tissue, and through this the bronchi and blood-vessels make their course; the former may be the seat of bronchiectatic dilatations, the latter of a sclerotic inflammation. The pulmonary alveoli are to a greater or less extent encroached upon by the over-growth of interstitial tissue. In the tuberculous type of the disease there may be miliary tubercles or cavity

formation. There is compensatory emphysema of the uninvolved lung, and the right ventricle of the heart is hypertrophied and perhaps dilated. Microscopically the fibrous infiltration begins in the wall of the bronchi and spreads thence to the alveolar walls the entire lobule ultimately becoming fibrous and firm. If the interstitial pneumonia follows an acute infectious pneumonia the exudate in the air vesicles becomes organized into fibrous tissue and a connective tissue change takes place in the alveolar walls as well.

Symptoms. Of these the most constant is cough which is much more distressing at some times than at others; it may be paroxysmal. With the cough there is muco-purulent expectoration; when bronchiectatic cavities are present considerable quantities of sputum may be raised from time to time, this manifestation occurring when the cavity is emptied; this sputum may be foetid. Hæmoptysis may take place. Dyspnoea is a frequent symptom; it is seldom of very distressing character. The course of the disease is chronic and may be protracted for years, but the patient is seldom prevented from doing light work.

Physical Signs. Inspection reveals a retraction of the thorax upon the affected side and a restriction in its respiratory movement; the unaffected side is more prominent and of greater circumference than normal as a result of compensatory emphysema. The apical impulse of the heart may be displaced. Vocal fremitus is diminished if the pleura is thickened. Upon percussion there is dulness or a tympanitic note; over a bronchiectatic cavity the note is amphoric. The note over the unaffected side is hyper-resonant. Auscultation over lung that is solidified by fibrous change reveals a diminished respiratory murmur, broncho-vesicular or even bronchial breathing, or, if a cavity is present, amphoric breathing. The voice corresponds to the respiratory sounds. The hypertrophy of the right ventricle of the heart results in an accentuated second pulmonic sound; failure of this ventricle is evidenced by the appearance of cardiac murmurs.

Diagnosis. This is usually easy; fibroid phthisis may, however, be mistaken for interstitial pneumonia. Differentiation may be made upon the more frequent fever, signs of tuberculosis in the other lung, and upon the presence of tubercle bacilli in the sputum in the former condition.

Prognosis. This is unfavorable as to recovery. The course of the disease is prolonged—ten years or even more. Death usually takes place from gradual failure of the right side of the heart, more rarely from hyaline degeneration of the viscera, or hæmoptysis.

Treatment. This consists in the employment of tonics, nourishing food and all measures calculated to improve the patient's general condition. Life in a warm dry climate may do much to increase the sufferer's comfort and to prolong his life. Respiratory exercises may be advised but should be carried on under the physician's supervision. The cough may be controlled by the means suggested in the section on the treatment of chronic bronchitis, and

should the sputum become foul the treatment applicable to fœtid bronchitis is indicated. Hyoscyamus or belladonna may lessen the tendency to spasmodic cough.

EMBOLIC PNEUMONIA.

Hæmorrhagic Infarct of the Lung.

Etiology. This condition is caused by the lodgment in one of the branches of the pulmonary artery of an embolus, which may contain infectious agents but not in sufficient quantity or virulence to cause abscess, which has had its origin in or has reached the right heart from the systemic circulation. Large emboli may cause sudden death, smaller ones cause infarcts of varying size unless the site of lodgment is not in a terminal artery. In this case collateral circulation may be established.

Pathology. Pulmonary infarcts are conical in shape and correspond to that portion of the pulmonary area which is deprived of its blood supply by the plugging of its artery by the embolus. The base of the cone is toward the periphery of the lung and the infarct varies in size from that of a pea to that of an egg; when fresh it is red-brown in color and its pleural surface projects beyond the surrounding tissue. The pleura covering it becomes the seat of a deposit of fibrin. In consistency it is more or less solid owing to the transudation of blood which later undergoes an inflammatory change. This consists first of an emigration of leukocytes from the neighboring vessels, then disintegration and absorption of the red blood cells takes place, causing the dark red or brownish color of the infarct to diminish. Finally the infarct becomes pale and the tissues which have been the seat of the transudation contract until little but a fibrous scar remains. The ultimate result is a grayish contracted spot in the lung. If there is a deposit of hæmatoidin crystals the resulting color is dark red. Larger infarcts may soften in part and disintegrate, the degenerated portion being absorbed or expectorated. In certain instances the scar in the lung may undergo cheesy degeneration and calcification.

Symptoms. Large emboli, as has been stated, may cause sudden death without symptoms save those of syncope, unconsciousness, and convulsions. Smaller emboli are evidenced by increasing pain in the side and, if a portion of lung of considerable size is obstructed, there is dyspnœa. Cough with bloody expectoration may be present. The physical signs depend upon the size of the infarct. In those of small area only the signs of a localized pleurisy are obtainable. If the consolidation is of large extent there are dulness, exaggerated vocal fremitus, crepitant and subcrepitant râles, and bronchial voice and breathing.

Diagnosis. The symptoms in slight instances where the infarct is of small size may be insignificant. In more marked instances the sudden onset with pain in the lung, cough and dyspnoea, without rise of temperature, especially if the patient is the subject of arterial disease, renders the condition one not easily to be mistaken.

Prognosis. This is good except when the embolus is very large; here death may take place without warning, a considerable portion of the lung being left without blood supply.

Treatment. The patient should be kept absolutely quiet in bed. The pain may be relieved by counter-irritation in the form of dry cups or a mild mustard paste; if this symptom is very severe, morphine, with or without atropine, may be necessary. Otherwise the treatment is wholly symptomatic.

Septic Embolic Pneumonia.

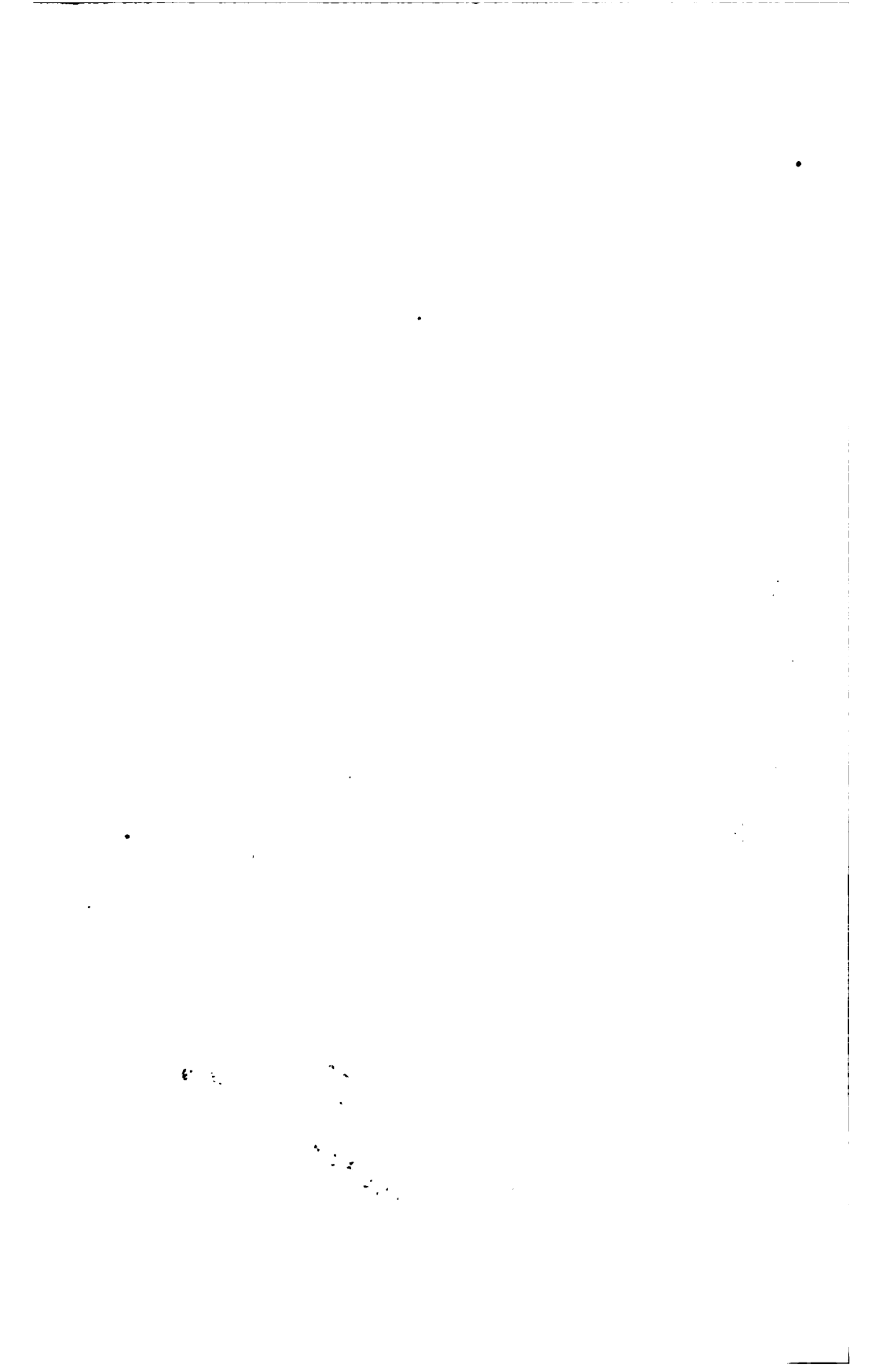
Synonym. Metastatic Abscess of the Lung.

Ætiology. This condition is the result of the lodgment of a septic embolus in one of the vessels of the lung. Such infective emboli may become detached from a thrombus in a vessel at a localized infective process, such as a septic phlebitis, operation wound, compound fracture, septic puerperal uterus, etc. The embolus passes through the circulation into the right heart, thence it reaches the lung, through the vessels of which it is transmitted until it reaches one of insufficiently large calibre to permit its passage; here it lodges and, being charged with infectious matter, causes the formation of an abscess.

Pathology. The early stage is evidenced by the appearance found in simple pulmonary infarct; the extravasated blood is, however, more plentiful. Marked inflammation soon arises, the tissues are infiltrated with leukocytes which rapidly degenerate into pus, and the whole area of the infarct softens and becomes an abscess cavity, which if near the pleura may rupture into the cavity of this membrane resulting in pyopneumo-thorax, or, the inflammation spreading by extension, simply a pyothorax.

Symptoms. The patient usually is suffering from pyæmia (*see* p. 127) before the lodgment of the embolus; this adds to the symptoms of the primary condition a sudden pulmonary pain and a chill followed by rise of temperature and diaphoresis.

Treatment. If possible the abscess should be located and opened surgically and drained. If it is not extensive, recovery from the abscess, dependent, of course, upon the primary disease, is likely to take place. Otherwise the treatment consists in the administration of stimulants and the employment of other means applicable in pyæmic conditions, (*see* p. 129).



See Army
reports concerning

Berberis

Surveillance's

Report for

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BERIBERI.

Synonyms. Kakke; Barbiere.

Definition. A multiple neuritis of specific origin occurring epidemically and endemically in tropical and sub-tropical countries and characterized by motor and sensory paralyses and a tendency to œdema.

Ætiology. This disease is most commonly observed in Malayan countries where it attacks chiefly the natives; Europeans are affected with comparative infrequency. It prevails extensively in China, Japan and in the Philippines, and from time to time appears in epidemics which may be attended by great mortality. In our own country instances are not infrequently observed in the various seaports, and the disease has been met in insane asylums in Alabama and Arkansas, in Louisiana, and among Chinese fishermen in Alaska. The chief predisposing cause seems to be the aggregation of a number of individuals in crowded quarters, barracks, jails, ships, etc., under unsanitary surroundings, in connection with an improper or insufficient diet. The disease is seldom seen at high altitudes, and warmth and dampness are the most favorable meteorological conditions for its development. Males are more frequently affected because they are more frequently exposed, and the majority of instances occur in adolescents and young adults.

The theories that the disease is caused by a diet of fish, of diseased rice, or by intestinal parasites are untenable, but it is a fact that there has been a great diminution in beriberi in the Japanese navy since a more general dietary has been allowed, which fact leads Takaki to believe that a regimen containing too much carbohydrate and too little proteid is a considerable factor in the production of the disease. It is, however, quite likely that rice is really the medium through which the germ of this disease operates because if cured, be substituted for uncured rice the disease disappears.

The germ theory of the affection has various arguments in its favor which are summed up by Hamilton Wright in the statement that beriberi is due to a specific micro-organism entering the mouth and developing and evolving a toxin, chiefly at the pyloric end of the stomach and in the duodenum, which is absorbed and acts upon the peripheral endings of the afferent and efferent neurons. He believes that the specific cause of the disease is given off in the fæces and is capable of producing the affection whenever conditions of weather, climate, and mode of life are favorable. At such times the specific germ entering the body upon food or drink gives origin to the disease.

Pathology. The most constant and characteristic morbid changes are a degeneration of the terminal branches of the peripheral nerves, atrophy of the nerve cells of the heart and of the terminations of the pneumogastric nerve; later the trunk of this nerve, as well as those of the phrenic and splanchnics, is involved. There is a secondary atrophic degeneration of the heart muscle and of the voluntary muscles. There is likely to be dilatation of the ventricles

of the heart, especially the right, and serous effusion into the pericardium, pleural cavities, peritonæum. and cellular tissues. This type of œdema is probably the result of vasomotor disturbances, and with the dilatation is more distinctive of beriberi than other forms of multiple neuritis. Wright has found in acute instances congestion and petechial hæmorrhages in the pyloric end of the stomach and in the duodenum. He believes these to be the specific pathologic changes of beriberi and that they are constant in instances terminating fatally within three weeks of the onset.

Symptoms. The incubation period is indefinite but is probably a number of months. Premonitory symptoms, such as anorexia, epigastric pain, respiratory oppression, and slight fever, are common; chills and cerebral symptoms are more unusual.

Four clinical forms of the disease may be described.

(a) *The mild or incomplete form* of which the chief manifestations are pain, weakness, and numbness in the legs. There may be small and distinctly marked areas of anæsthesia; œdema of the legs may be present; palpitation and cardiac irritability are common. Muscular weakness and abdominal distress may occur. Such instances of the disease usually last only a short time but may recur during the next warm season or develop a sudden acute attack of cardiac weakness.

(b) *The dropsical or wet form* resembles in its onset the preceding type, but œdema, beginning in the feet and legs and soon involving the whole body including the serous cavities, soon appears; the nervous symptoms are not particularly marked but cardiac disturbance, with dyspnœa and cyanosis is frequent and distressing. There is likely to be found pulsation of the jugular veins, denoting tricuspid insufficiency and dilatation. The heart is very irritable; the pulse rate quickens on slight exertion.

(c) *The atrophic form* is characterized by an increasing disability to walk, there are pains and contractions in the muscles of the legs; the paralysis extends to the body and sometimes to the arms; there are areas of hyperæsthesia and anæsthesia, and there may be extensive atrophy of the muscles with wrist and foot drop; there is ultimate loss of both galvanic and faradic irritability. Cardiac symptoms are slight and may be absent.

(d) *The acute pernicious form.* Here the symptoms of onset may be those of the mild type of the disease with suddenly developing manifestations of cardiac failure, or the attack may be of the cardiac type from its inception. There is severe precordial pain with marked palpitation and dyspnœa; the patient gasps for breath, the face is anxious, the lips are flecked with blood-stained froth, and death may occur within twenty-four hours, but usually life is prolonged for several weeks. Nausea and vomiting and diminished or suppressed urine are often seen when the disease is near its termination.

Fever is not usually noted after the onset of beriberi unless caused by a complication or a recrudescence. Various cutaneous manifestations such as

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mottling of the limbs and petechial and herpetic eruptions of the lips, are not infrequent. The urinary solids are usually diminished as also is the total quantity of the excretion. Albuminuria is not present.

Diagnosis. In the tropics this is easy, and instances of neuritis, especially if associated with œdema, seen upon vessels coming from tropical ports should be viewed with suspicion. In doubtful instances irritability of the heart, if present, is strongly in favor of beriberi.

Prognosis. In the pernicious instances this is most unfavorable; in other types the mortality varies in different epidemics from two to thirty percent. It must be remembered that patients apparently doing well may suddenly manifest most distressing heart symptoms. The sensory, motor and trophic disturbances are not permanent.

Treatment. Much may be done in the way of prevention. The diet should be rich in fatty and nitrogenous food and only cured rice should be eaten. All over-crowding should be avoided.

The patient should be immediately removed from the building, ship, camp, or locality in which he contracted the disease. For all that it is a germ disease. it is with difficulty communicated from man to man. The diet should be generous and regulated in accordance with the suggestions given above. He should be allowed to be up and in the open air as much as possible, and his apartment should be one which may be thoroughly ventilated and to which the sun has free access. Massage and friction should be prescribed, and in the dropsical type of the disease this symptom may be relieved in the usual manner by means of diuretics and diaphoretics; the bowels should be opened by laxatives when necessary. Accumulations of fluid in the serous sacs may be drawn off by aspiration if indication exists. In the trophic type faradism, galvanism, massage, hot and cold douches, and friction are useful. The cardiac attacks necessitate the administration of stimulants, and here our chief dependence should be placed upon inhalations of amyl nitrite in emergencies and, if necessary, upon the continued use of erythrol tetranitrate. The action of this drug is more regular and lasting than that of glyceryl nitrate (nitroglycerin), to which it is analogous, and tolerance is not easily established; it is best given in pills of one-half a grain (0.03), made up with kaolin every four to six hours. Glyceryl nitrate is useful as is also digitalis in full doses. Venesection and the withdrawal of twelve to fourteen ounces (350.0 to 420.0) of blood will often tide the patient through a cardiac paroxysm. The precordial pain and sense of oppression may be relieved by the hypodermatic use of morphine.

Tonics have a place in combating the tendency to wasting and anæmia, and arsenic, potassium iodide, iron, the glycerophosphates and strychnine are all useful. The hypodermatic injection of the following prescription has been suggested. Sodium cacodylate 1.5, iron and ammonium citrate 3, strychnine sulphate 0.03 part and water twenty-five parts. The dose is seven

and one-half minims (0.5) at first, to be gradually increased to double this amount.

The treatment of the paralyses and of the muscular atrophy is identical with that of similar conditions occurring in an ordinary multiple neuritis. (See p. 862.)

MYCETOMA.

Synonyms. Madura Foot; Fungus Foot.

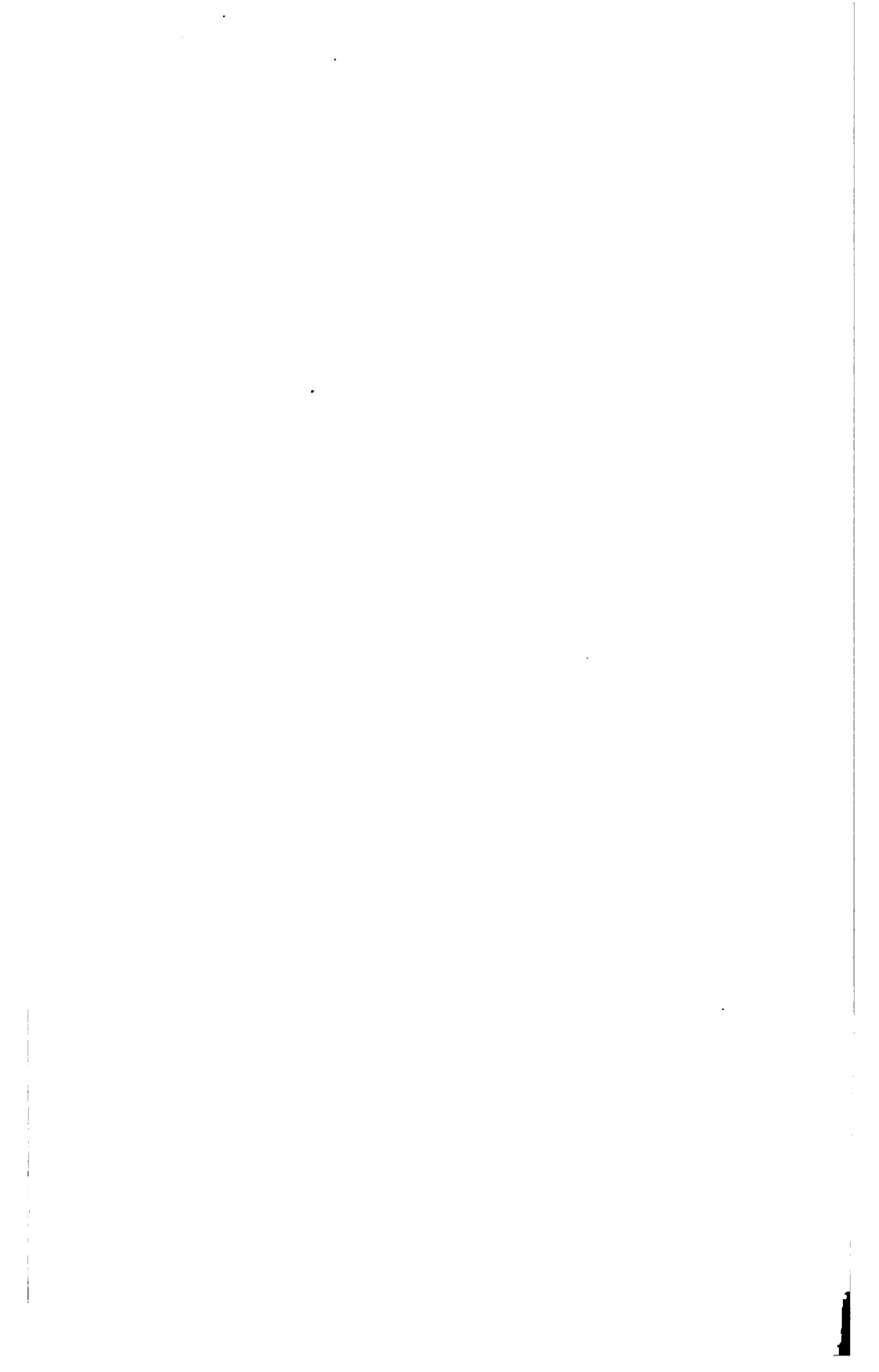
Definition. A fungus disease of warm climates, affecting principally the foot, due to mycotic infection and characterized by enlargement and deformity, degeneration, and formation of cyst-like cavities containing the infection.

Ætiology. The disease is caused by some form of mycetoma of which two belong to the species *discomyces*; two are certainly and the remainder probably of the species *aspergilli*. Brumpt gives the species as follows: (a) Actinomycotic mycetoma, caused by the ray-fungus *discomyces bovis* (Hartz, 1877). (b) Vincent's white mycetoma, caused by *discomyces madurae* (Vincent, 1894). (c) Nicolle's white mycetoma, caused by *aspergillus nidulans* (Eidam, 1883). (d) Bouffard's black mycetoma, caused by *aspergillus bouffardi* (Brumpt, 1906). (e) Classic black mycetoma, caused by *madurella mycetomi* (Laveran, 1902). (f) Brumpt's white mycetoma, caused by *indiella mansonii* (Brumpt, 1906). (g) Reynier's white mycetoma caused by *indiella reynieri* (Brumpt, 1906), and (h) Bouffard's white mycetoma, caused by *indiella somaliensis* (Brumpt, 1906), Madura foot is most common in India but is observed in other Asiatic countries, Europe, and South America.

Symptoms. The nodules appear upon the sole and are at first hard and dense, later they break down and persistent sinuses result which discharge a foul pus which contains the black, yellow, or rarely red granules. The foot increases in size and ultimately all its tissues become involved and fused together, a soft oily mass resulting. The appearance of the affected extremity is typical, its surface being the seat of the discharging sinuses, its sole thickened and the toes extended. In certain instances there may be metastases in other parts, the disease being transmitted by the lymphatics.

Diagnosis. Syphilis and bone tuberculosis should be kept in mind, but the foul pus containing the fungus is distinctive.

Treatment. This, with the exception of the early administration of potassium iodide in from forty to sixty grains (2.50 to 4.00) daily in some forms, is wholly surgical. Complete excision of the diseased tissues may be effectual if done early enough; when the entire extremity is involved amputation becomes necessary.



FEBRICULA.

Synonyms. Ephemeral Fever; Irritative Fever.

Definition. A transient febrile disease due to any one of a number of irritant causes. The term ephemeral fever is applied to instances in which the rise of temperature lasts not over twenty-four hours. If the febrile movement persists for several days the condition may be denominated febricula or simple continued fever.

Etiology. The usual cause of these disturbances is a disorder of the digestive function, caused either by temporary derangement or by some irritant or toxic quality of the ingested food, by the changes in which ptomaines or toxalbumins are produced—intestinal auto-intoxication. The existence in the body of the specific ætiologic factor of one of the infectious diseases in insufficient amount to cause the typical manifestation of the affection may result in an abortive form of the infection which may disappear within a few days without having been evidenced by any characteristic symptom. Such conditions may be met in epidemics of scarlatina, enteric fever, etc., and other instances of idiopathic fever may be attributed to abortive types of pneumonia, rheumatism, tonsillitis, etc. It may be due to a slight local inflammation, as tonsillitis, lymphadenitis, or other disturbance. Sometimes nervous exhaustion from various causes or brought about by moderate insolation may be a valid cause. The inhalation of sewer gas and of other foul odors has been held responsible for the occurrence of transitory fevers, but it is possible that the condition has been mistakenly attributed to these causes.

Symptoms. These are usually sudden in onset but may be preceded by indefinite malaise. Rarely is there an initial chill. The rise in temperature is seldom over 103° F. (39.5° C.), the pulse is rapid, there are headache, bodily weakness, a coated tongue, loss of appetite, nausea, and vomiting. There may be either constipation or diarrhœa; the urine is dark, scanty, and often loaded with urates. Nervous symptoms, even delirium, are frequently observed in children. The temperature usually falls by crisis within a few days or a week.

Diagnosis. This must be made by exclusion. The absence of cutaneous manifestations or of local symptoms and the disappearance of the febrile movement within a few days are the most important points. Enteric fever, if there is enlargement of the spleen, should be definitely excluded.

Prognosis. This is excellent.

Treatment. This consists in clearing the alimentary tract by the administration of repeated small doses of calomel—one-fourth of a grain (0.016) every half-hour to six doses—followed by a saline purge, the restriction of the diet to fluids, the induction of free action of the skin and kidneys by giving the sweet spirit of nitre and one of diuretic potassium salts. The patient should remain in bed during the febrile movement and

tincture of aconite, five minims (0.30) given every two hours will tend to control this symptom and lessen the cardiac rapidity. Should there be marked evidence of intestinal putrefaction this may be combated by means of one of the bismuth salts, preferably the tetraiodophenolphthaleinate.

IDIOPATHIC CONTINUED FEVER.

Definition. From time to time protracted fevers are observed which last from a few weeks to several months and present no symptoms which aid in ascertaining their specific cause. These may be atypical forms of the various infectious diseases, enteric fever, Malta fever, etc.; they may be due to pyogenic, or rarely to pneumococcic infection.

Symptoms. These are a moderate febrile movement lower in the morning, higher in the evening, impairment of digestive function, prostration, and, it may be, manifestations referable to the nervous system. The spleen may be enlarged.

Diagnosis. These fevers are to be distinguished from enteric fever by the absence of the Widal reaction, from malaria by their resistance to quinine and the absence of the plasmodium, from tuberculosis by the absence of tubercle bacilli in the excretions and failure to respond to the tuberculin test. In the instances due to pyogenic infection the presence of an increased leucocytosis should aid in ascertaining the cause.

Prognosis. These patients usually recover. Fatal instances in most subjects develop manifestations from which an absolute diagnosis of some infection can be made.

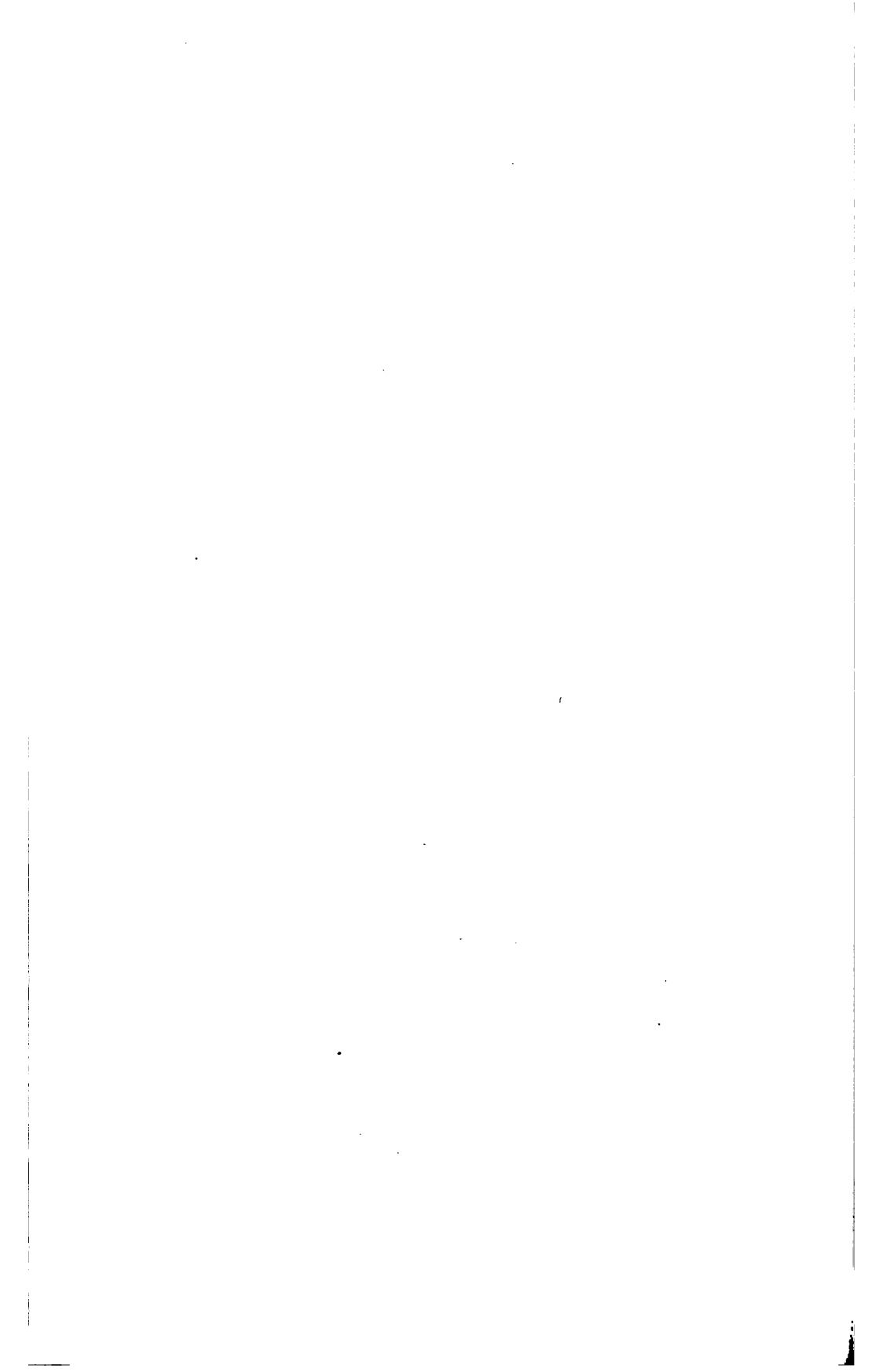
Treatment. This is eliminative and symptomatic; the bowels, skin and kidneys should be kept active, the diet should be of nourishing and of easily digestible fluids, and the various symptoms should be relieved as they appear. The patient's strength should be further maintained by the administration of tonics, particularly iron, quinine and strychnine, in small doses.

WEIL'S DISEASE.

Synonyms. Acute Febrile Jaundice; Infectious Jaundice; Epidemic Catarrhal Jaundice.

Definition. An acute disease, described by Weil in 1886, probably due to a specific infection and characterized by a remittent febrile movement, jaundice, and pains in the muscles.

Ætiology. This affection usually attacks individuals in young or middle life and males rather than females. It is more common in the summer months, and epidemics have been described as occurring in various parts of the world as India, Egypt, and South Africa. It is rare in Europe and America, although it has appeared in Greece and in North Carolina. Butch-



ers seem particularly prone to the infection,* and it is also frequent in brewers and laboring men.

The specific cause is not known but, while the *bacillus proteus fluorescens* has been held responsible by certain observers, it is probable that the condition may be caused by a number of infectious agents. It may be that acute catarrhal jaundice represents a mild, sporadic form of this infection.

Pathology. *Post mortem* examination reveals nothing characteristic. The intestinal mucosa may be congested and the liver and spleen hyperæmic; there may be acute degeneration (cloudy swelling) of the kidneys.

Symptoms. The onset of the disease is usually sudden, with a chill, followed by fever, headache, nausea, and perhaps vomiting and general muscular pains; the temperature is remittent and seldom rises above 104° F. (40° C.). Jaundice is an early symptom and is very variable in intensity; the stools may be clay colored. The liver and spleen may be enlarged, and the former is often tender. The urine is dark, heavy, and contains albumin and casts, bile pigments and perhaps blood. In the severer infections, which are rare, nervous symptoms and even delirium may be present. The fever lasts from one to two weeks and falls by lysis, as a rule. Secondary fever may occur.

Diagnosis. From bilious malarial fever this may be made by the failure to find plasmodia in the blood; from acute catarrhal jaundice by the presence of fever and pains; from acute yellow atrophy of the liver and phosphorus poisoning by the favorable course and outcome.

Prognosis. As to recovery this is good as a rule, but certain epidemics have been characterized by a considerable mortality.

Treatment. This is eliminative, supportive, and symptomatic. For the first consideration small doses of calomel to free purgation followed by sodium phosphate once daily until convalescence is established, should be prescribed. Cold bathing may be necessary in the severer types. The muscular pains are relieved by hot applications.

GLANDULAR FEVER.

Definition. An acute infectious disease of mild type, occurring chiefly in children and characterized by moderate pharyngeal congestion, fever, and enlargement of the cervical lymphatic glands, and, at times, those of the axillary and inguinal regions as well. This disease was described by Pfeiffer in 1889.

Ætiology. This affection is seldom seen after the age of sixteen years, and most instances are observed during the colder months. While probably due to a micro-organism which effects entry through the tonsils or pharynx, no specific cause for the disease has been isolated. Epidemics of glandular fever occur from time to time and the condition seems to be contagious since it often affects several children of the same family.

Pathology. The lymph glands are enlarged, but if they suppurate this is probably the result of some secondary infection; there is said to be enlargement of the liver and spleen. Certain observers state that there is accompanying enlargement of the lymph nodes of the bronchi and mesentery but others refute this assertion.

Symptoms. After an incubation of from five to eight days the disease is suddenly ushered in with stiffness in the neck, pain upon moving the head, loss of appetite, nausea and sometimes vomiting. There are pains in the head, abdomen, and limbs. The temperature rises to 102° to 104° F. (38° to 40° C.), the tongue is coated and the cheeks are flushed. After twenty-four to forty-eight hours, palpation in the cervical regions reveals enlargement and tenderness of the lymph glands. The throat and tonsils may be congested. The axillary and inguinal glands may be swollen. The evening temperature persists for from two days to a week when it falls to normal either gradually or by crisis; the symptoms soon ameliorate, but while the tenderness of the lymph glands disappears their enlargement may persist for several weeks. Recovery takes place almost without exception.

Diagnosis. This is simple, the various types of angina which are accompanied by glandular involvement being excluded by examination of the pharynx.

Treatment. At the onset the bowels should be freely moved, preferably by divided small doses of calomel or by castor oil. The fever and restlessness may be controlled by sponging with cool water or by small doses of acetphenetidine (phenacetine) or antipyrine. Rest in bed and a fluid diet should be enjoined during the febrile period. Cold or warm compresses may be applied to the tender glands; a compress wet in cold mercury bichloride solution (one to ten thousand) has been recommended. The after treatment consists in the administration of tonics, especially the syrup of iron iodide and codliver oil.

MILIARY FEVER.

Synonym. Sweating Sickness.

Definition. An infectious disease characterized by fever, profuse sweating and an eruption of miliary vesicles.

Ætiology. Very little is known of the causation of this affection; it occurs in epidemics which are distinctly localized; often the inhabitants of a certain town or district only are afflicted. It occurs most often in the spring and summer months, and seems to attack women more frequently than men. It is a disease of adults. Unhealthy surroundings and lack of sanitation do not seem to be predisposing causes. At present the disease is seldom seen outside of France, Germany, Austria, England, and Italy.

Pathology. No characteristic morbid changes have been described. The spleen may be enlarged; the blood is thin and dark.



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Symptoms. Mild prodromata such as malaise, headache and anorexia may precede the invasion of the disease or the onset may take place abruptly, the patient after retiring in apparently good health, wakes in the night bathed in profuse perspiration. The sweating persists and the patient suffers from precordial oppression or pain, epigastric discomfort, headache, muscular cramps, prostration, and the other usual symptoms of febrile disease. The temperature is elevated, the pulse accelerated, the respiration rapid. On the third or fourth day there is tingling of the skin followed by an eruption of tiny miliary vesicles containing clear fluid which later may become turbid; this secretion is not due to retained perspiration but is inflammatory in character. The vesicles rapidly increase in size and appear first upon neck and chest, spreading thence to the back and limbs. They break after two to four days and crusts form which later fall. With the incidence of the eruption the other symptoms abate. Rapid emaciation is characteristic.

The disease usually lasts about a week but is sometimes more protracted, the rash, at times, being delayed even for two weeks. Severe instances with hæmorrhages or pronounced cerebral symptoms have been observed. Relapses are not infrequent.

Diagnosis. During an epidemic, this is easy. The profuse diaphoresis and the miliary eruption are characteristic.

Prognosis. This varies, the mortality in certain epidemics being high; the mean death-rate is stated to be from eight to nine percent.

Treatment. The channels of elimination should be kept freely open by means of laxatives and diuretic drinks. Quinine is believed to be efficient in controlling the fever. The excessive sweating may be relieved, if necessary, by means of repeated hypodermatic injections of one one-hundredth of a grain (0.0006) of atropine sulphate and the patient's comfort may be greatly augmented by frequent sponging with tepid water. The sense of cardiac and respiratory oppression, if distressing, may necessitate the employment of hypodermatic injections of morphine. The patient should be kept in bed during the acuity of the attack and the diet should consist of nourishing and easily digestible liquids.

JAPANESE RIVER FEVER.

Synonyms. Flood Fever; Island Fever; Tsutsugamushi Disease; Kedani Disease; Akamushi Disease; Shimamushi Disease; Yochubio; Shashitsu.

Definition. Japanese river, or flood fever, is an acute infectious febrile disease which is observed in the workers who till the submerged banks of certain Japanese rivers. A similar disease occurs in the Philippines which may or may not be identical. Its causation is not definitely known, but it seems to be due to an organism, found in corn or hemp fields which have been recently submerged, and at the point of its entrance into the body an ulcer

is developed. The natives believe the disease to be the result of the bite of an insect, the word *mushi* in Japanese meaning bug. The three hypotheses are (a) that it is caused by a bacterium, (b) that it is a protozoan infection, and (c) that it is due to a toxin contained in the body of the red mite. The last seems to be the most probable.

Pathology. Necropsy reveals no characteristic morbid changes; bronchial congestion, considerable enlargement of the spleen and of the mesenteric lymph nodes may be found.

Symptoms. The invasion of the disease is marked by the appearance of a round ulcer in the inguinal region, neck or axilla. This may be preceded by a prodromal period of several days during which the patient complains of weakness and chills. Following the initial lesion there are lymphangitis of the vessels draining the region of the eschar, conjunctivitis, bronchitis, and a moderately high temperature. As the disease advances general slight enlargement of superficial glands occurs, and the temperature may reach 104° F. (40° C.) or even a higher degree. Albumin and casts are likely to be found in the urine which gives the diazo-reaction. The conjunctivitis and lachrymation are marked. The entire body may be hyperæsthetic; abdominal tenderness is marked. The breath is likely to be foul, the patient may become stuporous and die in coma. At the end of six or seven days a rash, consisting of red papules, breaks out upon the face, limbs, and body; this persists for from a day or two to a week. The elevation of temperature continues for about seven days more when the initial ulcer begins to heal, and if recovery is to supervene, the symptoms abate and rapid defervescence takes place.

Diagnosis. Malaria, enteric and typhus fever, pneumonia, and the plague need be excluded. The disease resembles Rocky Mountain spotted fever in many points, but it is not identical with it.

Prognosis. This varies; in certain epidemics the disease is very fatal; fifteen to seventy percent. One attack does not confer immunity.

Treatment. This consists in rendering the primary sore surgically clean and maintaining it in this condition, the application of cold to the area of lymphangitis, and the employment of approved methods to relieve the other symptoms as they arise. The cautious use of quinine and sodium salicylate has been advised. The infected region should be avoided. Those who are obliged to enter these regions should wear clothes saturated with petroleum.

AFRICAN TICK FEVER.

Definition. This is a disease prevalent in certain parts of Africa, particularly in the Congo, in western Uganda and in the western portions of German East Africa.

The affection is due to the introduction into the body by means of the bite of a certain variety of tick, the *ornithodoros moubata*, of a spirillum.

to
, General Wright



Symptoms. Observations upon this disease seem to show that the period intervening between the bite and the declaration of the disease is about one week. The invasion is abrupt but not marked by a distinct chill. There is prostration and the patient complains of headache and pain in the back and limbs. Food is distasteful and vomiting at the invasion is usual; moderate diarrhoea is common. The temperature is highest in the evening, an elevation of 104.5° F. (40.3° C.) not being uncommon. There are usually three to four attacks of fever which often terminate in sweating. Each attack lasts three or four days and the intervals from five to nineteen days. Splenic enlargement may be observed and herpes, hiccough, and epistaxis may occur. The principal characteristic of the infection seems to be the prostration during the febrile attack and the quick return to comparative health with the subsidence of the temperature.

Prognosis. Under proper care the disease is seldom fatal and it would seem that one attack confers immunity.

Prophylaxis. The ticks, which inoculate this disease into the human being, infest the rest houses along the traveled roads and seem to be nocturnal in their habits. By dusting pyrethrum powder in the beds and about the room the hosts of the infective organisms can be destroyed.

The natives, when bitten, burn the ticks which they are able to capture and rub the ashes into the scarified skin at the site of the bite as a preventive of the fever.

TRYPANOSOMIASIS.

Definition. This term is applied to the two conditions which may result from the occurrence within the human body of the *trypanosoma gambiense*. This trypanosome is an elongated flagellated body in length two to four times the diameter of a red blood cell; its body is fusiform, more or less curved and spirally twisted, and is elongated into a single flagellum at one end; an undulatory membrane extends throughout its length, at the base of which, at the non-flagellate end, is a small refractive body which is regarded as a centrosome. Near the middle of the body is an oval nucleus. It is analogous to several other trypanosomes, notably, *trypanosoma Brucei* and *trypanosoma Evansi* which are respectively parasites of horses and cattle and rats, and is transmitted to man by the bite of the tsetse fly (*glossina palpalis*), and perhaps by other means.

The conditions which result from inoculation with the *trypanosoma gambiense* are the so-called trypanosoma fever and sleeping-sickness or African lethargy. Both these affections occur at present only in the tropical regions, although instances have been imported into other countries in the past. The blacks are chiefly affected, trypanosomiasis being extremely rare in the white colonists and missionaries; one or two cases of sleeping-sickness in Caucasians, have, however, been reported.

It is a recognized fact that the trypanosomes may be present in the blood without causing significant symptoms, but under certain conditions definite manifestations occur.

Trypanosoma fever is characterized by a temperature of irregular type which may reach 104° F. (40° C.) and may be continuous or remittent. At intervals of from a few days to two or three weeks, periods during which the temperature falls to normal occur. Erythematous patches and scattered areas of oedema, the latter being particularly likely to involve the lower eyelids, may appear. The pulse-rate is rapid, the tongue is red, and there is progressive wasting and weakness. The superficial lymph glands are enlarged and examination of their fluid contents frequently reveals the presence of the trypanosome. Blood examination shows a moderate anæmia and a large increase in the number of mononuclear leukocytes as well as the presence of the trypanosome free in the plasma; the last may be absent at times for considerable periods, but when present is more numerous during periods of fever.

Treatment. The patient should be kept in bed and so protected that he cannot be bitten by the flies which transmit the disease, in order that he may not prove a source of further infection. The diet should be nutritious and easily digestible. Arsenic seems to have some effect upon the parasites in the blood and may be administered hypodermatically. The best results are said to be obtained by iron arsenate and sodium cacodylate. Ehrlich and Shiga consider that a new aniline dye, trypan-red, is useful in this affection. It is said to have no direct effect upon the parasites within the body but is believed to possess the property of causing a reaction which results in their destruction. Malachite green may also be employed. The combination of these substances with arsenic has been suggested. Otherwise the treatment is wholly symptomatic.

Sleeping-sickness is a chronic condition resulting from the presence of the *trypanosoma gambiense* in the cerebrospinal fluid and is probably the terminal stage of trypanosoma fever. It occurs chiefly in negroes, less frequently is it seen in half-breeds.

Pathology. The disease is a meningo-encephalitis. After death the cerebrospinal fluid is found to contain red blood cells, leukocytes, and trypanosomes. The capillaries of the brain and cord are surrounded by an infiltration of round cells. A mixed infection with streptococci may be observed late in the disease.

Symptoms. After a prolonged incubation period, perhaps of several years, the invasion takes place and may be characterized by various symptoms referable to the nervous system, such as convulsions and mental disturbances; there may be headache, dizziness, rapid pulse, and elevation of temperature. When the affection has fully developed the patient suffers from mental dulness and lethargy, from which he may be aroused to perform the

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bodily functions; speech is indistinct, the gait is uncertain, and immediately upon being left to himself the patient falls into deep slumber from which it becomes progressively harder to arouse him. The body gradually wastes, bed sores make their appearance and death takes place either from secondary infection or in coma preceded by paralysis or convulsions.

Fluid withdrawn by lumbar puncture contains the trypanosome.

Prognosis. The disease may last for several years and it is believed to be uniformly fatal in outcome.

Treatment. This is probably ineffectual, but free purgation early in the infection and the administration of arsenic in large doses, in the form of atoxyl commencing with one-half of one grain (0.03) every second day, increasing half a grain (0.03) each week until a maximum of three grains (0.20) is reached, may possibly be successful; this dose is continued until the trypanosomes are no longer found in the blood. The other substances mentioned under the treatment of trypanosoma fever are also recommended.

KALA-AZAR.

Synonyms. Tropical Splenomegaly; Burdwan Fever; Dum-dum Fever.

Definition. A distinct chronic infectious disease of tropical regions characterized by persistent irregular fever, anæmia resembling the progressive pernicious variety, emaciation, cutaneous pigmentation, and hepatic and splenic enlargement.

Ætiology. The results of recent research lead us to believe that this disease has for its specific cause the Leishman-Donovan parasite described in 1903. This organism is a form of trypanosome and is to be found in the blood particularly that withdrawn by splenic puncture, which must be practised with great caution, at some period in every instance of the disease, being especially abundant during fever and when intestinal symptoms are present and particularly toward the termination of the disease. It is an ovoid body with a spherical nucleus at one side; a number of these may be grouped in the form of a rosette.

Kala-azar occurs in low-lying, more or less water-logged districts of Asia and Egypt where the rainfall is heavy. Natives are most frequently attacked, the disease being rare in Europeans.

Symptoms. The onset of the affection is marked by chills, fever, and gastric irritability. Splenic enlargement is constant, increase in the size of the liver is frequent. The temperature is of irregularly remittent type and may persist for months; periods when the fever is absent may occur from time to time. The patient becomes emaciated and anæmic, hæmorrhages into the skin and mucous membranes may take place and purpuric rashes and evanescent œdema may be observed. A grayish or blackish pigment may be deposited in the skin, and there are muscular pains.

Diagnosis. Leukæmia malaria and Banti's disease must be excluded.

Prognosis. The death rate is high, ninety-six percent., complications, particularly dysentery, being often responsible.

Treatment. Isolation and quarantine should be insisted upon for it has been shown that by these means the disease can be made to disappear. Quinine has no specific action upon the cause of the infection but may control the temperature to some extent. The treatment consists chiefly in the use of arsenic in the form of atoxyl, given in three grain (0.20) doses every third day by intramuscular injection and continued for a year or more, in the employment of hygienic and symptomatic measures and in combating the anæmia and bodily wasting by nourishing food and tonics. The removal of the patient from the infected district is advisable, notwithstanding the fact that the disease only attacks acclimated persons.

LEPROSY.

Synonym. Elephantiasis Græcorum.

Definition. A chronic infectious disease occurring in two forms, (a) *tubercular leprosy*, which is characterized by the development of nodules in the skin and mucous membranes; and (b) *anæsthetic leprosy* in which there is a nodular infiltration of the nerve trunks. The two forms tend eventually to become combined.

Ætiology. Leprosy has been known since the time of Moses. At present it is endemic in certain parts of Asia, the Sandwich Islands, the West Indies, Greece and Turkey, and instances are not infrequently seen in Sweden, Norway, Iceland, Australia, South Africa, Mexico, Canada, and in the Southern and Northwestern United States.

The disease attacks both sexes and all ages and Hutchinson believes that a diet of fish is a factor in its causation, either inducing a susceptibility by lessening the bodily resistance or by carrying the contagium in its substance. A diet lacking in proteids seems to predispose to the disease.

The specific cause is the *bacillus lepræ* discovered by Hansen in 1874 a micro-organism closely resembling the tubercle bacillus in certain particulars but easily differentiated by staining and chemical reactions.

Mode of transmission. It is probable that very close association with patients is necessary to acquirement of the disease, for physicians and nurses who are in close contact with sufferers are seldom attacked. The possibility of the hereditary transmission of the affection is to be considered but it is without doubt of the very rarest occurrence. It is not certain that the disease may be contracted by direct inoculation but it is probable that this is the case.

The bacilli are given off in the discharges of suppurating lesions, in the saliva and nasal mucus when there are leprous manifestations in the throat or nose, and have been found in the urine and milk. They may be borne upon clothing, and the disease has been transmitted by fomites. The most

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probable portal of entry for the contagium is through the respiratory tract, and certain observers believe that it may be contracted during coitus in the same fashion as syphilis.

Pathology. The nodes occurring on the mucous membrane and skin in the tubercular form of the disease are composed of small cells supported upon a framework of connective tissue; within and between these cells the lepra bacilli exist in large number. The nodules finally break down and form ulcers which may heal and cicatrize; in the ulcerative process fingers and toes may be lost and the conjunctival and laryngeal mucous membranes may be affected.

In the anæsthetic type there is a peripheral neuritis resulting from the growth of the bacilli within the substance of the nerve fibres.

Symptoms. (a) *Tubercular leprosy*: An intermittent febrile movement lasting for many months may precede the other symptoms; before the nodules develop there are often areas of erythematous redness upon the skin; their edges are well-defined, and there may be cutaneous hyperæsthesia; pigment may be deposited in these spots, which may later disappear, without the development of nodules, leaving white anæsthetic areas (*lepra alba*). More commonly the tubercular nodules appear and persist, it may be, for years; ultimately they, for the most part, ulcerate, but some may disappear without undergoing this process. The occurrence of nodular growths, in the face, together with the cicatrized areas may give rise to the appearance termed the *facies leontina*; at times the nose and ears may ulcerate, and the breaking down of nodules in the cornea or larynx may cause blindness or loss of voice. Obstruction to respiration and even death may be caused by tubercles in the nose, pharynx, or larynx. Inhalation pneumonia is not infrequent.

(b) *Anæsthetic leprosy* is evidenced by pains in the limbs, hyperæsthesia or numbness; the infiltrated nerves may be palpable under the skin and while at first tender, later become anæsthetic. Trophic disorders such as dryness or smoothness of the skin or the appearance of small bullæ may be noted. Leprous spots rarely perspire. Areas of cutaneous anæsthesia appear and may be preceded by maculæ which later disappear. Vesicles form which rupture leaving ulcers behind, and the trophic disturbances may result in wasting and atrophy of the limbs and even the dropping off of fingers or toes. The disease may last for years without impairing the patient's functions, but the increasing exhaustion finally overcomes him.

Diagnosis. Of an advanced instance of either type this is very simple. Syringomyelia, syphilis, and various skin manifestations must be borne in mind. In the earlier stages the areas of erythema with sensory disturbance and enlarged nerves are quite typical. In doubtful instances a section of the skin from an anæsthetic area or of a tubercle should be examined for the presence of the *bacillus lepræ*.

Prognosis. This is not favorable as regards recovery, although this has

occurred in the anæsthetic type, with, however, persistent trophic lesions. Considerable improvement, which may continue many years, frequently follows removal to a more temperate climate. The course of the disease is chronic, lasting even twenty or thirty years; it is more rapid in the ulcerative variety. Death may take place from intercurrent disease or from the progressively increasing weakness.

Treatment. Isolation or segregation should be insisted upon in all instances, although in that part of the United States lying in the temperate zone there is no record of infection. This is preferable to the legalized compromise which obtains in Norway; here the indigent lepers are cared for in an institution while those whose income is sufficient are permitted to remain at home under proper care and restrictions. A leprous mother should not nurse her infant and it should associate with her as little as possible.

Treatment proper consists in attention to cleanliness, general hygiene and surroundings, and the administration of plenty of nourishing food; certain observers consider that a diet too rich in carbohydrates and poor in proteids is a factor in the causation of the affection, consequently it would seem well to prescribe a regimen containing plenty of nitrogenous food. The internal administration of chaulmoogra oil often causes marked benefit. It may be given in beginning dose of five minims (0.30) morning and evening, the dose being increased daily by four minims (0.25) until the patient is taking as much as two hundred and fifty minims (16.0) daily in four doses. The drug may be given in milk, hot tea or in capsules and should be continued for three months. If gastric disturbance is caused the oil may be given *per rectum*, two drachms (8.0) in milk being the proper quantity, or it may be administered hypodermatically in daily dosage of from one to two drachms (4.0 to 8.0). An efficient substitute for chaulmoogra oil is sodium gynocardate which may be given in pill form; twenty to eighty grains (1.30 to 5.00) may be given daily. Gurjun oil is at present little used.

Encouraging results have been reported from the hypodermatic employment of mercury bichloride and sodium chloride, each one-quarter grain (0.015), in twenty minims (1.30) of distilled water. This solution is injected deeply into the muscles twice a week. Ichthyol is recommended in tubercular leprosy and may be given in doses of one-half to two and one-half drachms (2.0 to 10.0) daily. Large doses of potassium iodide may be given in the hope of causing the erythematous nodes to disappear. Thyroidin, which represents about six times the same amount of the dried thyroid gland, sometimes may produce excellent results in improving the metabolism in anæsthetic leprosy. Other drugs from which favorable results have been obtained are sodium salicylate, potassium chlorate, and sodium cacodylate. Calmette's antivenene, given hypodermatically in doses of five to seven drachms (20.0 to 28.0), has been administered with benefit in certain patients. The injections are given every two days at first, then daily.

See Isadore Dyer's
Cultivation experiments
also treatment by
Nastine

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Deyecke, finding in an instance of nodular leprosy the *streptothrix leproides*, which can be cultivated and yields a definite fatty substance, called nastin, has proposed to utilize this remedy in connection with benzoyl chloride which deprives certain bacilli of their acid-fastness. The theory of its action is that nastin, having affinity for the fat of the lepra bacillus, acts by introducing the benzoyl chloride which is the actual bactericide. The dosage should be arranged so that there ~~may~~ be no excessive reaction, the injections need not be too frequent, and the remedy must be persevered in for months and even years, occasionally omitting the treatment for a month or two. Many favorable reports have already been recorded.

Locally inunctions of pyrogallic and chrysophanic acid and of twenty percent. salicylic acid have been recommended. The nodules before ulceration may be cauterized with the thermo- or galvano-cautery after which powders, such as thymol iodide or iodoform, may be applied. The latter should also be dusted upon ulcerations or a five percent. phenol ointment, five percent. euophen (an organic iodide compound) in olive oil, or one part of gurjun oil to two parts of lime water may be employed.

The frequent application to the nasal and buccal cavities of mild antiseptic solutions and of ten to twenty percent. silver nitrate to ulcerations of mucous surfaces is to be advised.

The neuralgic pains may be controlled by the administration of the coal tar analgesics, aconitine, or gelsemine. Nerve stretching may be advisable in extreme instances.

Very recently excellent results have been reported as following the treatment of leprosy by means of the Röntgen-ray. At least one patient seems to have been cured since the presence of the bacilli, easily demonstrable before exposure to the rays, have disappeared as a result of their application, and improvement in a number of other patients has been noted; whether the results are permanent, time alone will tell. Wilkinson, who makes the report, believes that when a lesion is treated the organisms in that situation are killed and their bodies absorbed, producing an immunity against the living organism. The part which presents the greatest involvement is selected and exposed to the ray usually for ten minutes at a distance of from seven to ten inches. The effort is made to approach as near to burning the skin as possible without actually doing so. After two or three treatments a blushing of the skin is noticed and there is a sensation of itching. Of the three patients in which the result was considered to be successful in two the treatments were fourteen in number, in the third, fifty-two.

Recently rather remarkable reports have been reported as due to the administration of a fluid extract of mangrove (*rhizophora mangle*). At first two drachms (8.0) are given morning and evening, later this dosage is increased to three ounces (90.0) daily. Each night the patient is given a bath at 102° to 104° F. (38.9° to 40° C.) to which enough mangrove

decoction has been added to redden the water. A light diet, chiefly of fruit and milk, is prescribed together with tonics such as coca and kola; no acids nor spices are allowed. The patient is advised to sleep in a cool room and to avoid the hot sun. Ulcers, if they appear, are dressed with thirty percent. solution of the fluid extract of the mangrove in water.

FRAMBOESIA.

Synonym. Yaws.

Definition. A chronic contagious disease chiefly observed in the tropics and characterized by the development of granulomatous tissue in the true skin.

Ætiology. This affection is common in Africa, Southern Asia, and the islands of the Pacific. In the West Indies, Central and South America it is less frequent. It is rarely met in the United States. Dark skinned races are more frequently attacked than whites and, while yaws may occur at any age, children are most frequently affected. It is, however, neither hereditary nor congenital. While undoubtedly of bacterial origin, the specific micro-organism of the infection had not been isolated until Castellani, in 1905, found an extremely delicate spirochæte, *spirochæta pertenuis* or *pallidula*, very like to that of syphilis. The disease is transmissible by direct inoculation through an abrasion of the skin and also by food and eating and cooking utensils.

Symptoms. The period of incubation varies from two weeks to six months. Prodromal symptoms, such as malaise, anorexia, headache, and pains in the muscles and joints, may be present, particularly in children, during this period. The invasion of the disease is marked by the appearance of a furfuraceous eruption which occurs in varying extent over the face, the limbs and trunk, and desquamates. This eruption not only appears at the commencement of, but may persist during, or reappear at, any stage of the disease. In experimental yaws a primary sore appears at the site of inoculation. This is at first a small papule which within about seven days becomes a shallow ulcer which in turn soon heals leaving an indurated scar. The primary lesion may be wanting in certain instances. With the initial sore the secondary eruption may appear or, more usually, it is several weeks before its occurrence. It may be preceded by a pallor of the skin with a bran-like desquamation.

The furfuraceous rash having been in existence for a few days, small papules appear which are particularly numerous near the muco-cutaneous junctions. The papules enlarge, forming tubercles under the skin as large as a good sized pea; at the top of these pustulation soon commences, and the skin breaking, a yellowish fluid is discharged which dries, forming a tough firm crust, under which the tissue is papillomatous, resembling a raspberry in appearance. From this raw surface there is an exudation of viscid yellowish

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pus. Pain is seldom present but there is usually an annoying pruritus. Successive crops of lesions may appear and after several months they diminish in size and scab over, the crust ultimately falling and leaving behind a spot of increased pigmentation in whites and of skin lighter than the normal in dark races. In prolonged and untreated instances a third stage may occur, characterized by breaking down of the nodules, pains in the bones and joints, periostitis, and bone caries, particularly a destructive, ulcerating rhino-pharyngitis.

Diagnosis. Yaws is to be distinguished from syphilis, to which it bears so close a resemblance that certain observers consider them the same or at least analogous diseases, by the lack of induration in the initial sore, of gland enlargement, of secondary involvement of the mucous membranes, and of vascular thickening. Verruga bears a close similarity to yaws but is histologically a distinct disease.

Prognosis. This is usually good; excepting during the initial fever and the relapses the general health is good. The mortality is less than three percent.

Treatment. Isolation of all patients should be practised, all abrasions of the skin should be properly treated and protected, and buildings in which patients afflicted with the disease have lived should be avoided. Constitutional treatment consists in the administration of potassium iodide; general tonic treatment, iron, arsenic, etc., are often necessary adjuvants. Mercury, owing to its likelihood of provoking anæmia, should not be used internally. The external lesions should be kept clean by the application of antiseptics and, generally, should be protected by dressings of iodoform ointment or of mercuric nitrate ointment. Sluggish ulcers should receive stimulation by means of silver nitrate and balsam of Peru, and the chronic nodules may be treated surgically.

VERRUGA.

Synonyms. Peruvian Warts; Verruga Peruviana.

Definition. A chronic infectious disease characterized by a prodromal febrile stage, rheumatic pains, and the subsequent development of granulo-matous wart-like excrescences upon the skin, mucous membranes, and viscera.

Etiology. This disease is endemic in Peru in certain narrow valleys upon the western incline of the Andes. It is not contagious but is inoculable and may appear in epidemics. The natives believe that it is contracted by drinking the water of certain springs. It attacks all ages and both sexes, and seems to be intimately associated with a pernicious type of enteric known as "Oroya Fever." Its specific cause is unknown, but a bacillus somewhat larger than the tubercle bacillus has been described by Yzquierdo. One attack usually confers immunity.

Symptoms. After an incubation period of from two weeks to forty days the invasion of the disease takes place; prodromata, such as malaise, and a tired sensation in the limbs, persist for a few days and are succeeded by an afternoon rise of temperature. The latter becomes gradually more marked and may be either remittent or intermittent in type. There are chills and pains in the joints of the extremities and in the spine; the pain is more severe at night and attacks one articulation after another. Muscular contraction involving the sterno-mastoid and calf muscles may be observed. The patient loses flesh and becomes anæmic, there is hepatic and splenic enlargement.

After about three weeks the eruption appears and with its incidence an amelioration of the other symptoms, including the pain and fever, occurs. The rash shows itself first upon the face, the extremities, and about the joints; the hairy parts are involved, but rarely the trunk; it begins as small pinkish spots, soon becoming papular and dark red or bluish in color. The papules vary in number from only a few to several hundred, in size from that of a small pea to that of an orange; they are vascular and bleed easily and spontaneously. When occurring upon the internal organs they may cause difficulty in swallowing and bleeding from the œsophagus, stomach, bowel, bladder or uterus. The growths persist for several months and either dry into black spots which disappear leaving no trace, or ulcerate or suppurate.

Prognosis. This is much more favorable in the natives than in whites, the mortality varying from about ten percent. in the former to seventy percent. in the latter. An early incidence of the eruption augurs a favorable course and outcome, but delayed and atypical outbreaks signify a severe type of the disease.

Treatment. The removal of the patient to the lower levels near the sea is always to be advised, because cold tends to delay the appearance of the eruption which marks the termination of the painful febrile stage. Quinine should be administered on account of the possibility of a malarial element in the infection. Tonics and stimulants are often necessary. The ulcerous and suppurative excrescences should receive antiseptic treatment. External hæmorrhages should be treated by pressure sufficient to control them. In other regards the treatment is supportive and symptomatic.

MEASLES.

Synonyms. Rubeola; Morbilli.

Definition. An acute infectious febrile disease, often occurring in epidemics, and characterized by congestion of the upper air passages and a dusky red eruption of maculo-papular form.

Ætiology. The disease is commonly endemic, epidemics occurring in most thickly populated districts about every two years. It prevails chiefly during the cold months and appears usually in children, but adults may be

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Chapter 152

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attacked. Infants under three months seem to possess a certain degree of immunity. Measles is almost certain to be communicated to those not rendered immune by previous attacks and, when introduced into regions where the disease has previously been unknown, is extremely fatal.

The specific cause of measles is undoubtedly a micro-organism, but, while various bacteria have been found in the secretions of sufferers, none of these has been proven to be directly causative of the infection. The contagium is given off in the conjunctival, nasal and bronchial secretions and these are infective even before the stage of eruption. Dried particles of the secretions

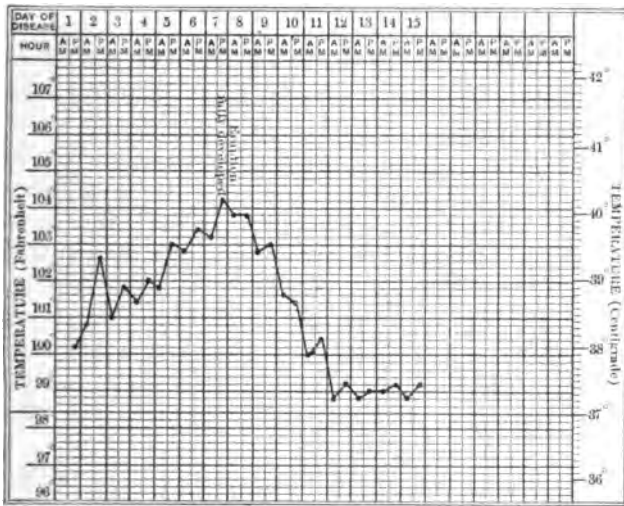


FIG. 8.—Clinical chart of measles showing defervescence by lysis when the eruption is fully developed.

may collect upon clothing, furniture, etc., the latter thus becoming capable of transmitting the infection. The contagium is, however, short lived.

One attack usually, but not always, confers immunity. While mistaken diagnoses are responsible for many apparently repeated attacks, it is undoubtedly true that susceptible individuals may suffer from the infection more than once.

Pathology. The *post mortem* appearances in measles are in no way characteristic. The catarrhal condition of the conjunctival mucous membranes is not distinctive. Death is usually due to complications, especially broncho-pneumonia, and the typical lesions ordinarily found in this condition are present. Infectious pneumonia with collapse of the lung may be found and swelling of the lymphatic tissues throughout the body, tonsils, lymph nodes, and intestinal follicles, may occur. There may be slight splenic

enlargement. In instances of malignant or black measles hæmorrhages are present.

Symptoms. The incubation period is from seven to fourteen days, rarely a few days longer. Prodromata such as malaise, sneezing and feverishness may be noted at the end of this period. Leukocytosis may be present.

The period of invasion lasts three or four days, during which the symptoms of conjunctivitis and rhinitis are noted. The onset may be gradual or sudden and marked by chilly feelings—rarely a distinct chill—or a convulsion. The fever at first is not very high and may remit upon the second day. Following this the temperature rises to 104° to 105° F. (40° to 40.5° C.). Other symptoms of the onset are cough, nausea, and vomiting. The pulse is rapid and full. As the fever falls the pulse returns to normal.

The symptoms continue for about four days and in severe infections cerebral manifestations may be present. On the fourth day the typical eruption appears. This consists of maculo-papules, at first rounded, rose-colored and slightly elevated, later tending to coalesce into crescentic shapes. The rash appears first upon the face and mucous membranes, then upon the body, the extremities becoming finally involved. At first the papules impart a shot-like feeling to the finger and may be mistaken for the eruption of small-pox. The rash disappears on pressure, is fully developed in from two to four days, and then gradually fades. In from ten to fourteen days fine desquamation, lasting from a few days to several weeks, takes place. At the height of the eruption there may be enlargement of the glands of the neck.

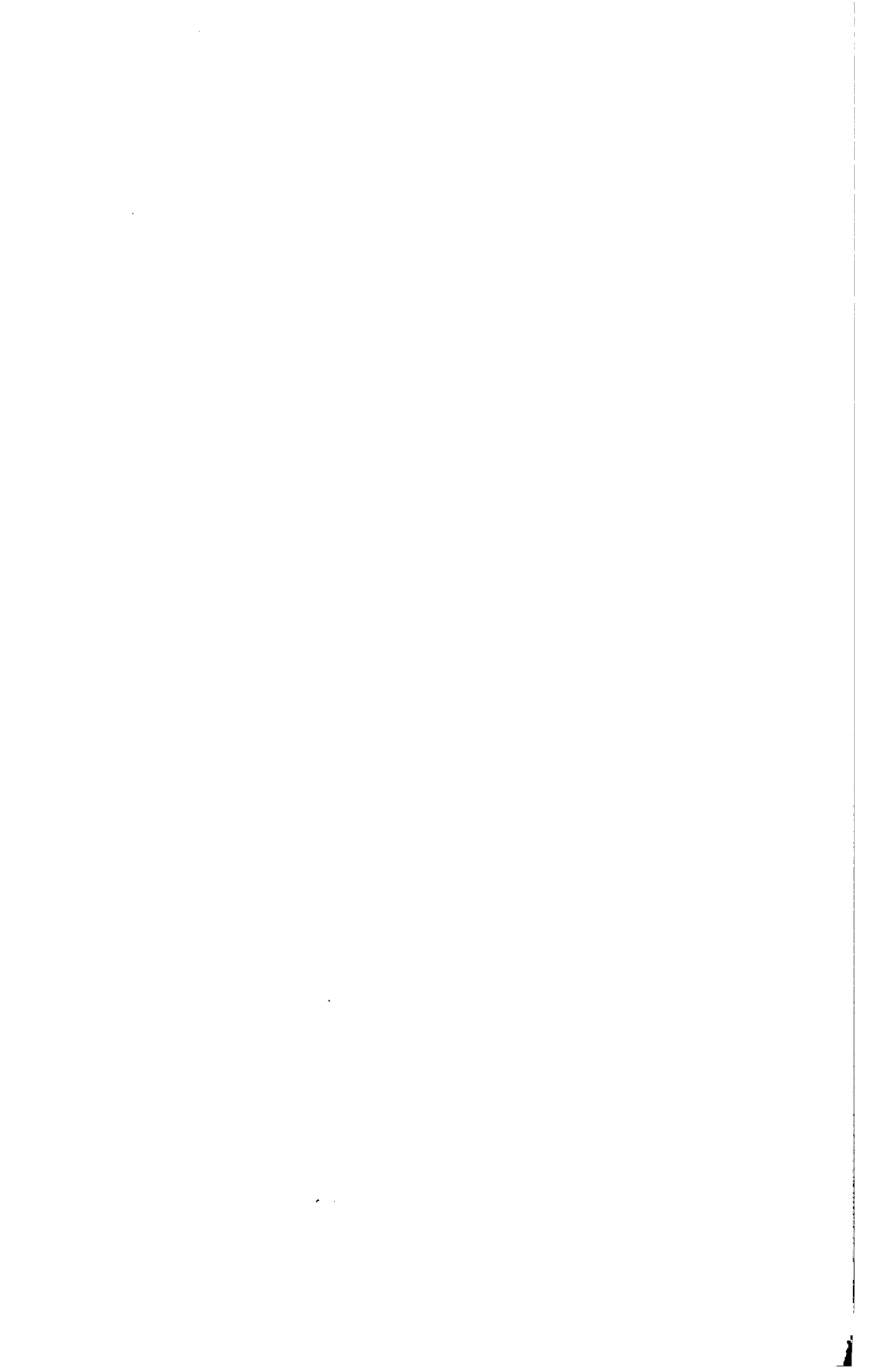
A day or two before the eruption small red spots from the size of a pin head to that of a split pea appear on the lining of the cheeks and mouth. At the center of these is a bluish-white spot which may be made out with the aid of a strong light. The white spots may be removed by means of a forceps and, being examined, are shown to consist of epithelial cells in a state of fatty degeneration. These are known as Filatov's or Koplik's spots and are an important early diagnostic sign.

The symptoms of the disease continue until the eruption has reached its height. On the fifth or sixth day it begins to fade, the temperature begins to fall gradually, and the symptoms become ameliorated.

Variations from the typical course may take place. *Morbilli sine morbillis* is the term applied to the disease when the symptoms are manifested, but no eruption appears. A mild type, in which all the symptoms are slight and recovery takes place within a few days, has been described. Malignant or black measles is a severe and fatal type, characterized by hæmorrhages into the skin and from the mucous membranes; here the prostration is marked and all signs of a severe toxæmia are present.

Complications. It is these which render measles a disease to be dreaded.





Broncho-pneumonia is the most common and may be diagnosed by the persistence of the cough and high temperature and by the physical signs of small areas of pulmonary consolidation. Infectious pneumonia may also complicate the disease. Less frequent complications are otitis media, laryngitis, diphtheria, ulcerative or gangrenous stomatitis, keratitis, and parotitis. Nephritis, endocarditis and joint inflammations and nervous complications, while fortunately rare, have been observed. Among these may be mentioned hemiplegia, paraplegia, meningitis, multiple neuritis, and cerebral abscess.

Pulmonary tuberculosis may develop as a sequel of measles and, in patients of suspicious diathesis, when the cough is obstinate, this possibility should not be forgotten. Diphtheria is not an uncommon complication in institutions.

Diagnosis. During epidemics this is not difficult. Early in the affection the appearance of the spots upon the buccal mucous membrane is an aid in differentiation. The early involvement of the nasal lining and the conjunctiva as against the sore throat and enlarged glands of scarlatina should aid in differentiation from the latter disease. Fever for four or five days, accompanied by catarrhal symptoms, buccal spots, and the appearance at the end of this period of a maculo-papular rash, tending to become crescentic, should differentiate this disease from chicken-pox and German measles.

Prognosis. In uncomplicated instances which occur amid good surroundings this is favorable, provided the patient's general condition is good. In epidemics under unsanitary conditions as in asylums, army camps, etc., the disease is likely to be attended by a high death rate.

Poorly nourished patients and those affected with previous chronic disease are very prone to complications, especially infectious pneumonia, and in this event seldom recover.

Treatment. *Prophylaxis* consists in immediate isolation and the removal of other children from the house. The latter should be kept from association with other children for at least two weeks in order that the disease, if contracted, may develop. Many parents encourage their children to expose themselves on the principle that every one must contract the disease and that it is less likely to prove serious in childhood than in adult life, but this is little less than criminal.

All discharges, dressings, clothing, the sick-room, etc., should be disinfected according to the usual methods. The contagium of measles being of feeble vitality the quarantine need not be insisted upon longer than four or five weeks.

Measles is a self-limited disease and unfortunately we have no means of aborting it or shortening its course. Its treatment, therefore, is symptomatic and supportive; much also can be done in the way of preventing the incidence of complications.

At the onset of the disease the patient should be put to bed in a darkened room and isolated. The apartment should be well ventilated and, while its temperature need not be high, the patient should be carefully protected from draughts. The bed covering need not be heavy, but should be sufficient to keep the patient comfortable. The bowels should be opened at the invasion of the disease by means of fractional doses of calomel followed by a saline, and they should be kept open throughout the disease by means of laxatives. The skin should be kept active and the kidneys mildly stimulated by the simpler alkaline diuretics or spirit of nitrous ether. The conjunctivitis may be controlled by means of the application of cloths moistened in cold water or by dropping a few minims of a saturated solution of boric acid into the eyes at intervals. The lids may be prevented sticking together by smearing their edges lightly with vaseline. Should the conjunctivitis become purulent a few drops of a five percent. solution of silver vitellin (argyrol) should be instilled at frequent intervals. The care of the nose and pharynx is most important since it is by extension from these parts that the middle-ear frequently becomes involved. The nasal cavity and the throat should be frequently sprayed with the official liquor antisepticus, diluted. Following the cleansing influence of these alkaline applications the inflammatory condition of the mucous membranes may be relieved by spraying with albolene, to an ounce (30.0) of which about ten drops (0.65) of eucalyptol or ten grains (0.65) of thymol or both have been added. The itching and burning of the skin may be relieved by sponging with tepid water to which a little sodium carbonate has been added or by rubbing in vaseline or oleum theobromatis. The fever ordinarily needs no especial treatment; should it rise to 104° F. (40° C.) or over it may be controlled by sponging with cool water or by small doses of antipyrine or acetphenetidine. In the early stages this symptom may be relieved by small doses of tincture of aconite—three to five drops (0.20 to 0.30)—every two or three hours. If this drug is given the pulse should be watched and the medication should be stopped at once if any sign of cardiac depression is noted. The cerebral symptoms may be relieved by cool sponging or cool packs and by the application of an ice cap to the head, but when the pulse is weak and the extremities are cold and cyanotic, warm baths with the addition of mustard are indicated. Stimulation may be necessary, especially if pneumonia is present as a complication, and here small doses of alcohol or strychnine should be employed. In collapse the hypodermatic administration of camphor in ether or oil is useful.

For the bronchitis simple cough mixtures containing expectorants such as ammonium chloride or ipecac in small doses, with the addition of codeine or heroine if the cough is distressing, should be prescribed. In order to prevent broncho-pneumonia it is necessary that the patient have a plentiful supply of fresh air and yet that all chances of exposure should be studiously avoided. A flannel jacket should be fitted to the chest, the skin of which

should be daily rubbed with olive oil to which a little turpentine or camphor may be added if desired. The administration of guaiacol carbonate is advocated in the treatment of the catarrhal manifestations of measles as being preventive of respiratory complications.

The various complications should be treated as when occurring independently. In institutions the occurrence of diphtheria as a complication may be prevented by the administration of an immunizing dose of antitoxin in each instance. According to Holt this procedure has been carried out with excellent results.

In instances when the eruption is delayed the patient should be given a hot pack by means of a blanket wrung out in hot water. This should be wrapped about him and then covered by a rubber sheet. This procedure induces profuse perspiration and the appearance of the rash.

The diet during the febrile period should be entirely fluid, consisting of milk, soups, and broth. When the fever has subsided a gradual return to an ordinary regimen may be allowed.

The patient should remain in bed for about a week after the temperature has reached normal and must not be allowed to use his eyes for about a month. While desquamation is taking place the skin should be kept soft by means of inunctions of oil or cocoa butter. For considerable time after convalescence has become established the patient should be kept from exposure to sudden changes of temperature; particularly is this necessary if there is persistence of the cough. Here the administration of codliver oil and creosote carbonate is indicated and a change of climate is to be advised, preferably to one of high altitude, slight humidity, and mild temperature. In ordinary instances tonics should be administered during convalescence and the diet should be plentiful, nourishing, and easily digestible.

RUBELLA.

Synonyms. Rötheln; German Measles; Epidemic Roseola.

Definition. An acute infectious febrile disease of mild type accompanied by a maculo-papular eruption and enlargement of the cervical lymph nodes and at times by mild catarrhal symptoms.

Ætiology. That this disease is distinct from measles and scarlet fever has been definitely proven. It occurs chiefly in children, although it may be contracted by adults. It is very contagious, although rather less so than measles, and appears both epidemically and sporadically. The infection is probably microbic in origin, but as yet its specific cause has not been isolated. The contagium is transmitted by direct contact with the patient and by fomites and is probably active from the beginning of the disease until well into the convalescent period. One attack usually confers immunity.

Symptoms. The period of incubation is from one to three weeks, aver-

aging about ten days, and while there are often no prodromata, for a period of two or three days before the appearance of the eruption the patient may complain of chilly sensations, general pains and malaise, sore throat, and slight fever. Mild bronchitis, tonsillar and glandular swelling in the cervical region may be present. Slightly before or synchronous with the appearance of the rash, which may be the initial symptom, the temperature rises to 100° to 103° F. (37.8° to 39.4° C.). The eruption appears first upon the face and spreads thence to the neck, trunk, and extremities. At times it is confined to one part while at others it involves the whole cutaneous surface including the palms, soles, and buccal lining. The rash is papular, rose-colored, and may become confluent, the papules fusing irregularly, while the surrounding skin may become hyperæmic. The papules vary in size but are smaller than those of measles and do not fuse in crescentic shapes. When the eruption involves the various parts of the body in succession it is seen in all stages at the same time. In other instances it may appear upon all parts simultaneously. It reaches its height within from twenty-four to thirty-six hours and lasts from two to five days as a rule, when it may terminate in slight desquamation, less marked, however, than that of measles.

Sore throat is almost always present and swelling of the cervical glands, and even of those of the axilla and groin may occur. Slight catarrhal symptoms referable to the mucous membranes of the eyes and nose are not infrequent.

The pulse is rapid in proportion to the elevation of the temperature; the latter falls with the fading of the rash and the other symptoms gradually ameliorate.

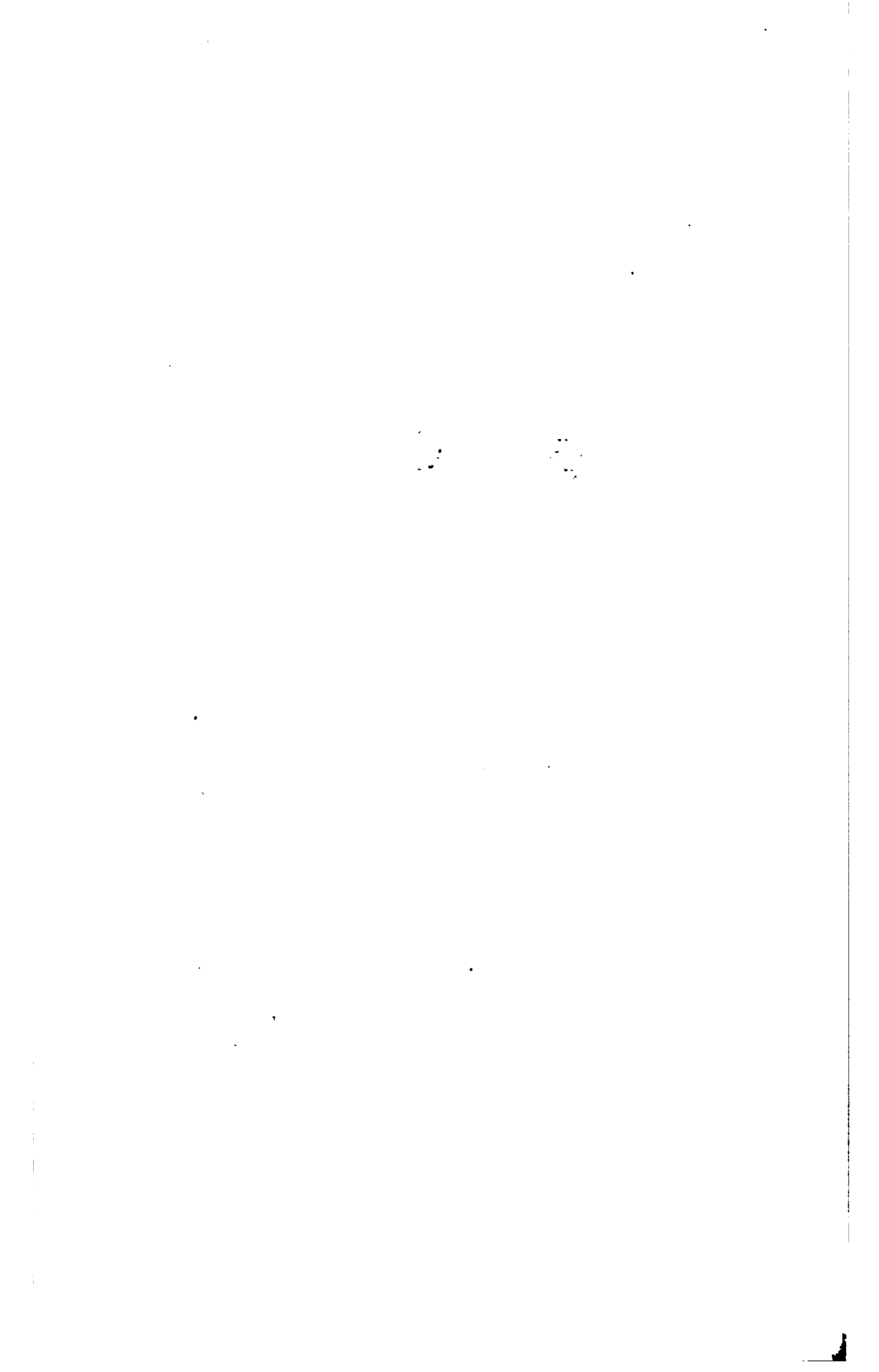
The course of the disease is from three to eight days, and convalescence is rapid. Relapses may occur, but complications are seldom seen. Rarely a complicating bronchitis, pneumonia, or digestive disturbance may be observed.

Diagnosis. In typical instances this is not particularly difficult. In instances indistinctly characteristic the problem is less simple. Such may be differentiated from measles by the absence of buccal spots and marked catarrhal symptoms, by the mildness of onset, paler and more diffuse eruption; from scarlatina by general mildness of course, absence of severe throat involvement, atypical tongue, and absence of general erythematous eruption.

Prognosis. This is generally most favorable, delicate children, those whose surroundings are unhealthful, and those who are unfortunate enough to be subjected to complications may succumb to the disease.

Treatment. The patient should be strictly quarantined until the diagnosis has been absolutely assured. Confinement to bed should be enjoined and fluid diet is necessary as long as the temperature remains elevated. The bowels should be opened at the onset of the disease by means of fractional doses of calomel followed by a saline and regular daily movements should be





secured by mild laxatives or simple enemata if necessary. The skin should be kept active and cleansed by means of a daily sponge bath; cool bathing may be resorted to if the temperature causes anxiety. The catarrhal symptoms should be treated just as in measles, and if there is cutaneous irritation this may be relieved by gently inuncting carbolized vaseline or oil of theobroma. The enlarged glands may be rubbed with a five percent. ichthyol, or compound iodine ointment.

The complications are to be treated as when they occur independently, and during convalescence the administration of tonics, such as iron, strychnine and codliver oil, may be advisable, especially in debilitated children.

SCARLATINA.

Synonym. Scarlet Fever.

Definition. An acute infectious fever characterized by a diffuse scarlet rash upon the skin and usually accompanied by pharyngeal inflammation.

Ætiology. The disease occurs endemically in nearly all parts of the world and amongst all races; the natives of East India and of Japan are said, however, to be to some extent immune to the infection. At intervals epidemics of varying intensity appear. The disease is most common during the autumn and winter months, and it affects chiefly children under the age of ten years. Certain individuals and some families seem to be insusceptible. Nursing infants seldom contract the disease; in pregnancy and after surgical operations individual susceptibility is increased.

An enormous amount of work has been done upon the bacteriology of scarlet fever, but up to the present time the results have been inconclusive. In a majority of instances the *streptococcus pyogenes* is to be found in the inflammatory exudates of the disease but, while certain observers believe this to be the specific cause of the infection, it seems more probable that this bacterium is present as a result of mixed infection and that the true cause of scarlatina is another micro-organism. Mallory, in 1904, found a parasite in the skin, a protozoön, the *cyclaster scarlatinalis*, which has also been demonstrated in the serum of blisters by Duval and which occurs in various forms, notably in the shape of a rosette, resembling the rosette stage in the reproductive cycle of the malarial parasite. Class, whose researches have been confirmed by others, has found in the blood, urine, scales of epidermis and in cultures from the throat a diplococcus which he named the *diplococcus scarlatina* and which may have some influence in the causation of the infection.

With regard to the bacteriology of scarlatina it may be definitely stated that the streptococcus is an important influence in the ætiology of the septic manifestations of the disease.

The contagium is much more resistant than that of measles, much less diffusible and less prone to infect those exposed. The latter fact may be due

either to a natural immunity enjoyed by certain individuals or to a peculiarity of the contagium.

Mode of transmission. The contagium is probably contained in the secretions of the throat, respiratory tract and ear, and in the particles of skin exfoliated at the termination of the disease. The disease may be communicated by direct contact with a patient or by fomites, the infection being very resistant and remaining viable for long periods in clothing, bed linen, books, etc. While the disease may be carried by a third person, this mode of conveyance is rare. Air may carry the infection for short distances and it may also be transmitted by means of milk with which infected persons have come into contact.

The poison usually affects the throat primarily, having been taken in upon the inspired air. It may also enter by means of the digestive tract. The fact that infants have been born while manifesting the disease at all stages would show that the infection may be transmitted by means of the blood. One attack usually, but not always, confers immunity.

Pathology. This disease presents no distinctive morbid changes. The eruption is ordinarily invisible *post mortem* unless it is hæmorrhagic in character. The throat exhibits the appearances of simple follicular or ulcerative tonsillar and peri-tonsillar inflammation with an accompanying lymphoid enlargement or even abscess formation in the neck in the more severe instances. The viscera, especially the kidneys, are the seat of an acute degeneration and may contain foci of necrosis. The pathology of the various complications does not materially differ from that of these same conditions when they occur independently.

Symptoms. The incubation period varies from one to fourteen days, but is usually two to six. The invasion takes place suddenly or after a short prodromal period, characterized by indefinite malaise. The initial symptom is usually emesis; chills or convulsions may occur. The temperature rises rapidly to 103° to 105° F. (39.5° to 40.5° C.), the pulse is proportionately rapid—one hundred and ten to one hundred and thirty—the face is hot and flushed, the tongue dry and the throat sore.

The eruption appears from twelve to thirty-six hours after the onset of the disease. The whole skin is flushed, and scattered over it are numerous tiny red points; these may occur in irregular patches or they may be widely disseminated. The rash appears first upon the neck and shoulders and extends rapidly; the skin of the whole body and of the limbs may be involved within forty-eight hours. When the eruption is at its height the skin becomes almost uniformly red and swollen, particularly upon protected parts. The redness disappears on pressure but returns instantly upon its removal. Upon the face the rash is least apparent and usually involves only the forehead and cheeks, the skin about the nose and mouth remaining pale. The eruption is present upon the pharynx. It remains at its height from one to

three days and gradually fades as the temperature falls. Variations of the eruption are not infrequent. In the severe types of the infection it is darker in color, and hæmorrhagic petechiæ may be present. Vesicles containing turbid fluid may appear (*scarlatina miliaris*). The skin is often rough to the touch, and itching and burning may be present. The rash usually begins to fade about the seventh to the tenth day and desquamation, lasting several weeks, takes place. This exfoliation may be so slight as to be difficult of perception after a poorly marked rash or, following one of severe type, the skin of the fingers and toes may come away in the form of moulds and the bits of desquamated epidermis may be numerous and of considerable size.

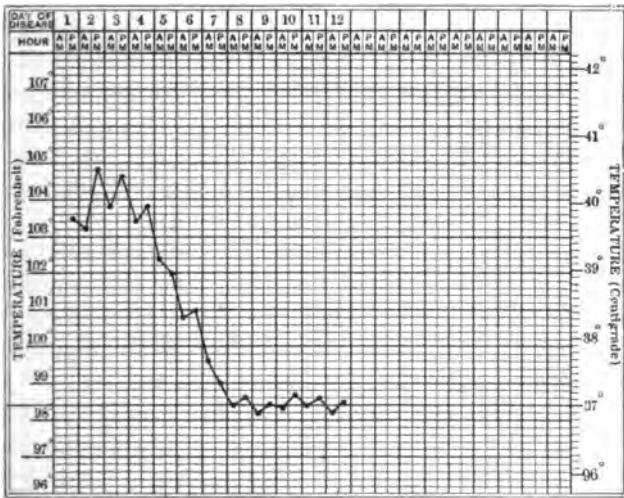


FIG. 9.—Clinical chart of scarlatina.

The tongue is at first red at the tip and edge with a whitish coat in its center through which the enlarged papillæ protrude, giving the so-called "strawberry" or "raspberry" appearance. As the disease continues the white coating is shed and the tongue is left red, rough, and even more like the surface of a strawberry or raspberry than before.

The pharynx may be the seat of a mild inflammation, of a follicular tonsillitis, or of a severe anginoid condition caused by infiltration, ulceration, and even pseudo-membranous inflammation of the pharyngeal structures; lymphoid enlargement and involvement of the cervical tissues may be noted. There sometimes is numbness and formication of both hands (Myers's sign).

The initial fever varies from 103° to 106° F. (39.5° to 41.1° C.), or even higher and continues with slight morning remissions until the rash begins to

fade, when it falls by lysis. Hyperpyrexia may occur in severe infections. The pulse is rapid in proportion to the height of the temperature and the respirations are also accelerated. The spleen may be slightly enlarged. The urine is scanty, hyper-acid, high colored, and often contains a trace of albumin and a few casts. This should cause no undue alarm as the urine is likely to become normal once more; it should, however, be examined daily since nephritis is an important and not infrequent complication. Leukocytosis may be present.

The duration of the febrile movement of an ordinary instance of scarlatina is from three or four days to two weeks, depending upon the severity of the infection.

Irregular forms of the disease occur. These are of three chief classes:

1. *Anginose scarlatina* which is characterized by severe pharyngeal symptoms; the throat is markedly swollen and dysphagia is present, upon the tonsils there is a pseudo-membranous exudate which may result in abscess formation and ulceration. The inflammation may extend to the larynx, trachea, and bronchi, and is almost certain to reach the middle-ear by means of the Eustachian tube. The disease may terminate in death, and sloughing of the tissues of the neck is not an unusual occurrence.

2. *Malignant scarlatina* is characterized by a severe toxæmia which may overwhelm the patient and result in death even before the eruption appears. Hyperpyrexia is present, the pulse is very rapid, soon becoming weak, the prostration is marked and the cerebral symptoms are profound. Death takes place from adynamia.

3. *Hæmorrhagic scarlatina* is typified by the appearance of extravasations of blood beneath the skin and mucous membranes resulting in epistaxis, hæmatemesis, intestinal hæmorrhage, hæmaturia, etc. This form of the disease is usually fatal.

Complications. Of these *nephritis* is the most important and perhaps the most frequent. It is of acute type and must not be confounded with the albuminuria which so often occurs when the fever is at its height. It is usually evidenced by the appearance of albumin and casts in the urine, but instances have been noted in which renal changes have been found *post mortem* when no symptoms suggesting nephritis had been present. The condition is probably the result of the toxic action of the poison of the infection and occurs in several forms: (a) A mild type with slight œdema and albuminuria and a few casts; (b) a more severe type, with more marked œdema, dark urine with more abundant albumin and casts and transudates into the serous cavities, resulting in death with uræmic symptoms, chronic nephritis or, as a rule, recovery; (c) a hæmorrhagic type, with scanty urine containing blood, albumin, and numerous casts. Anuria may occur, vomiting and convulsions are frequent; the outcome is usually rapidly fatal and due to uræmic poisoning.

Endocarditis is not rare. This may persist after recovery from the

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scarlatina or may occur in a malignant form which is usually fatal. *Myocarditis* and *pericarditis* are less frequent but are complications to be dreaded.

Pleurisy, empyema, bronchitis, and broncho-pneumonia are less common complications.

An *arthritis* may occur in one of two forms: an arthritis similar to that occurring in other infections such as enteric fever or gonorrhoea and involving several joints as a rule, or as a suppurative inflammation affecting one or more articulations. The prognosis is good in either type.

Otitis is a serious and not uncommon complication and is the result of the extension of the throat inflammation through the Eustachian tube to the middle-ear. Perforation of the tympanic membrane is frequent and mastoiditis with all possible complications may follow. Impairment of hearing or complete deafness may result.

Adenitis accompanied by glandular enlargement in the cervical region is very common and may go on to abscess formation and necrosis in the deep tissues of the neck.

Complications referable to the nervous system are rare but sometimes occur. Of these the most important is chorea which may be associated with the arthritis and endocarditis. Hemiplegia, progressive paralysis, and cerebral thrombosis have been observed.

Diagnosis. This is usually not difficult in typical instances; the rash, the pharyngeal symptoms, and the tongue being characteristic. Scarlatina may be differentiated from measles by its more abrupt invasion, the presence of throat symptoms, the absence of the buccal spots and catarrhal symptoms and the desquamation; from rubella by its more severe constitutional symptoms and characteristic tongue; from diphtheria by its eruption and by bacteriological examination, but it must not be forgotten that the two infections may be present simultaneously; from drug eruptions by the presence of constitutional symptoms and sore throat; and from acute exfoliative dermatitis by the presence of the characteristic tongue and throat symptoms. In dermatitis the desquamation differs, the skin being thrown off in crusts and scales; a moist surface is frequently left. Erythema multiforme may give rise to confusion, but in this disease the varying character of the eruption is distinctive.

Prognosis. This is variable. In some epidemics the mortality is high, but as a rule the death rate in this disease is not great. It is higher in infants and in institutions. The malignant and fulminating instances are fortunately not common for they are almost certainly fatal. Complications are usually responsible for death when this occurs in the ordinary type of the disease. Relapses in scarlatina are rarely observed.

Treatment. *Prophylaxis* is most important for, by proper methods, the disease may be to a great extent prevented. Isolation during the course of the disease and thorough disinfection of the sick-room and its contents are

absolute essentials. The physician should always cover his ordinary clothing with a long gown while visiting the patient and upon leaving should disinfect his hands and his face and hair in so far as is possible. Only the persons immediately concerned in the care of the patient should be allowed in the sick-room, all the excreta should be rigidly disinfected, and the skin, especially during desquamation, should receive inunctions or baths of an antiseptic solution to prevent dissemination of the exfoliated epidermis. The quarantine should be continued for from six to eight weeks after the onset of the disease.

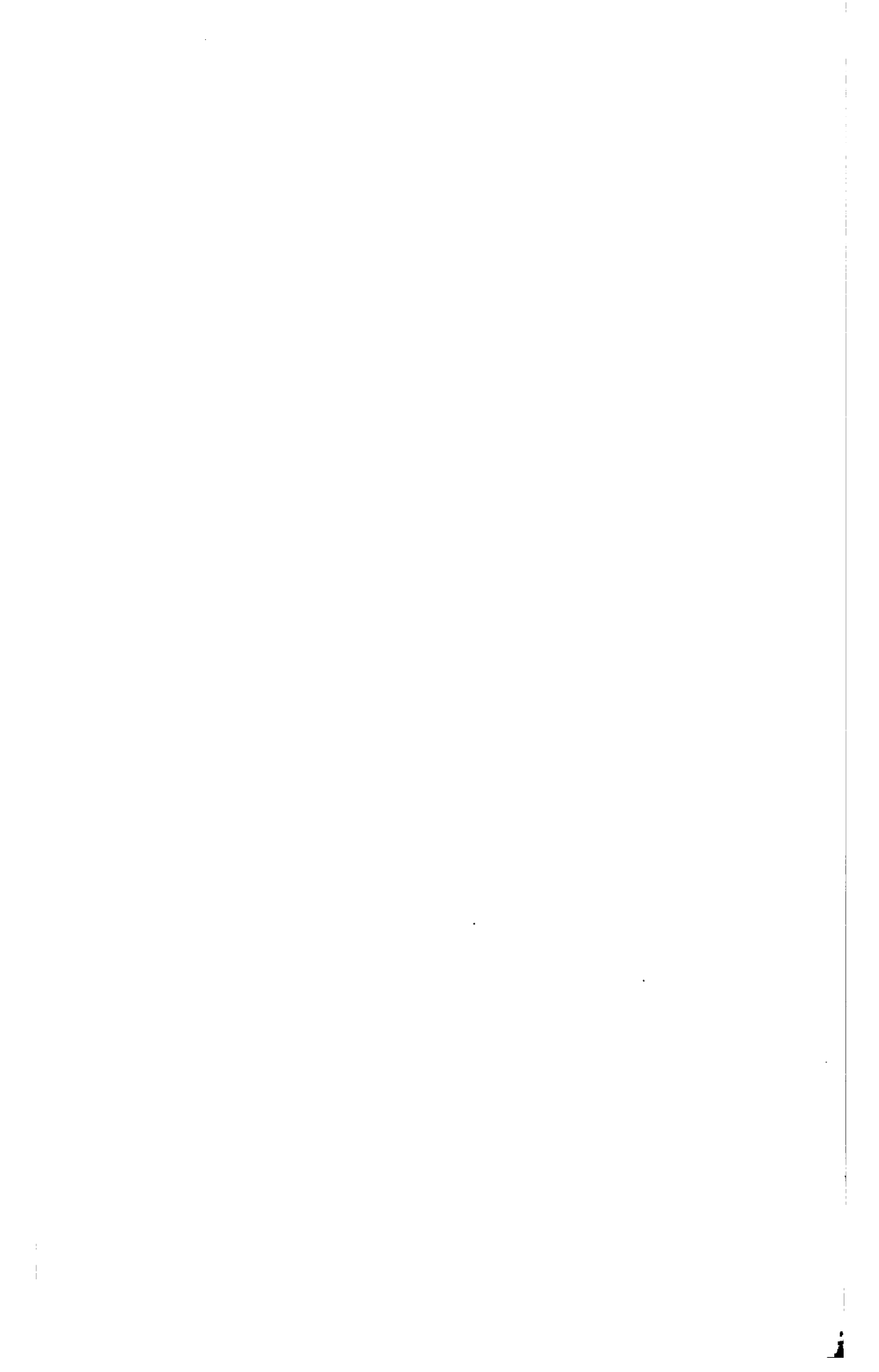
A careful system of school inspection will do much to prevent the spread of this infection.

The treatment of the disease itself consists in strict confinement to bed during the febrile period and for a week or ten days thereafter, the control of symptoms and in the prevention of complications. The mild types of the disease need little or no medication. The sick-room should be light, well ventilated, and kept at a uniform temperature of from 65° to 68° F. (18.5° to 20° C.). The itching and burning caused by the eruption may be relieved by inunctions of carbolyzed vaseline, five percent. ichthyol ointment in lanolin, or five percent. boric acid ointment in vaseline. Sponging with very weak (one-half percent.) phenol solution as well as dusting with talcum powder are also useful. Inunctions of colloidal silver (unguentum Credé) may exert an effect upon the septic nature of the disease as well as a beneficent influence upon the skin. Inunctions are particularly indicated during desquamation to prevent the dissemination of the scales. Baths of warm soapsuds may also be given and, if the skin is irritated, bran baths may be employed.

The temperature in ordinary instances may be neglected, but should it rise above 104° F. (40° C.) it may be reduced by the application of an ice coil over the heart, cool sponging, or cool packs. Quinine has been advocated; the only effect which it can have in this disease is to temporarily lower the temperature. For the cerebral symptoms cool sponging, the ice cap, and small doses of antipyrine salicylate, acetphenetidin, or antipyrine may be employed. These drugs, while reducing the tendency to insomnia and restlessness, also have an antipyretic effect. A daily sponge bath with tepid water and soap should be given for the sake of comfort and cleanliness.

Stimulation in the milder forms of the infection is unnecessary, but in severe instances of septic or anginose type with weak, rapid and irregular pulse it is indicated. Brandy or whiskey is usually preferable, the dose depending upon the condition in hand. Digitalis in the form of the tincture may be given when the pulse is rapid and of low tension, the dosage for a child five or six years old being one drop (0.065) every three hours. Strychnine in doses of from one two-hundredth to one one-hundredth of a grain (0.0003 to 0.0006) may be given alone or in connection with other stimulants.

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Throughout the disease the bowels should be kept freely open, an initial course of fractional doses of calomel followed by a mild saline being indicated at the onset. As the disease progresses saline laxatives may be given from time to time or the high intestinal irrigation with normal saline solution at 112° F. (44.5° C) may be employed. The latter is a most excellent stimulant and diuretic, and an aid of considerable value in the elimination of the poison of the infection.

Pilocarpine has been recommended in the treatment of scarlatina; it is said to reduce the temperature, to improve the condition of the throat, and to prevent glandular involvement. It should not be given with the coal tar antipyretics and, should idiosyncrasy to the drug be present, atropine will be found to be an effective antidote.

The simple form of pharyngitis needs no other treatment than a mild antiseptic mouth wash or throat spray of diluted liquor antisepticus which should be applied every four hours. Nasal involvement should be controlled by syringing or spraying with similar agents. The severer throat inflammations should be carefully treated in order to prevent, if possible, aural complications. Here hot, or preferably cold, applications should be made to the throat externally, and endeavors should be made to keep the throat itself as nearly clean as possible. Frequent irrigations of hot, mildly antiseptic solutions such as one-half saturated solution of boric acid, one-tenth of one per cent. iodine trichloride, two-tenths of one percent. salicylic acid, etc., are useful. The irrigation should be of considerable quantity and given while the child is lying with its head turned to one side and slightly lower than the rest of the body. It may be given by means of a fountain or ordinary syringe to which a soft rubber catheter is attached. If the swelling is marked and there is tendency to œdema, sprays containing one-tenth of one percent. adrenalin chloride may be employed and steam inhalations impregnated with compound tincture of benzoin or eucalyptol may be prescribed. Insufflations of equal parts of soziodol and sublimed sulphur are recommended; ten percent. phenol in solution in glycerin may be injected into the seat of the inflammation in instances of gangrenous tonsillitis.

Slight enlargements of the cervical glands usually subside without treatment, but more marked glandular involvement necessitates the employment of continuous cold by means of the ice bag held in place by bandages. Inunctions of ointment of colloidal silver (unguentum Credé) are useful and a thin gauze compress impregnated with ten percent. ichthyol ointment may be applied to the glands beneath the ice bag. The presence of pus demands immediate incision and drainage.

The prevention of complications is a most important part of the treatment of this disease. While at times these occur in spite of all attempts at prophylaxis, this fact should not deter the physician from employing every means in his power. In preventing the incidence of nephritis it is particularly

necessary to watch the urine carefully, examining it at least once a day, to studiously guard the patient against exposure to draughts, to continue the fluid diet and the confinement to bed for at least a week after all febrile symptoms have disappeared, and not to allow the patient to leave the sick-room too soon. It is far better to err upon the safe side in this regard than to permit the patient to go out too early. Recently the use of hexamethylenamine (urotropin) has been advocated as a prophylactic against scarlatinal nephritis and has seemed efficient in some instances while inert in others; it certainly can do no harm when given in proper dosage and carefully watched. The prophylactic use of digitalis has also been recommended, and it would seem that the employment of high rectal irrigations of hot saline solution should be effective. The treatment of scarlatinal nephritis, when it occurs, is identical with that of acute nephritis when occurring from other causes.

The prevention of aural complications consists in the methodical and thorough treatment of the pharyngeal conditions as laid down above. The drum membranes should be inspected daily for any sign of bulging and, when necessary, immediate paracentesis should be done, the opening to be kept free so long as there is the slightest tendency to discharge. The discharging ear should be irrigated with warm boric acid solution in considerable quantity every four hours. The practitioner should never hesitate to summon the otologist in consultation when the condition is in the least doubtful, for upon proper management of the aural complications of scarlatina the patient's hearing may depend. Mastoiditis, internal ear involvement, sinus thrombosis, etc., are conditions for the otologist alone and their discussion is beyond the scope of this work.

The treatment of the joint complications consist in immobilization and the application of hot moist compresses. While by no means always satisfactory in its results, the administration of the salicylates should be undertaken. These may be given in appropriate dosage by mouth, or salicylic acid may be given by inunctions as suggested under the treatment of acute articular rheumatism. Acetyl-salicylic acid (aspirin), adult dose from ten to fifteen grains (0.65 to 1.0), may be employed. The chronic joint complications necessitate the internal and external exhibition of the preparations of iodine. The presence of pus in a joint is an indication for immediate surgical interference.

The treatment of the other complications is identical with that to be instituted when these occur independently.

Advances have been made during recent years in the serum treatment of scarlatina by means of antistreptococcus serum; this serum is used rather to combat the complications which are due to streptococcus infection than with the hope of influencing the disease itself. The results, particularly those attained with Moser's serum, would seem to justify the employment of this means of treatment. It is particularly indicated in the severer and compli-

cated types of the infection. The serum is given in considerable amounts and acts best when administered in the early stages. The initial dose may be about five drachms (20.0), and a total quantity of six ounces (180.0) has been given. The disadvantages of the treatment are its costliness and the large amount of serum necessary. Von Leyden's so-called convalescent-serum is reported to achieve good results.

The treatment of convalescence consists in the employment of tonics and careful watching of the urine which should be examined at intervals for a considerable period. Persistent nasal and throat symptoms necessitate the employment of antiseptic sprays.

The diet of the disease should be wholly of milk—plain or peptonized—throughout the febrile movement and, as a preventive of nephritis, for a week or ten days after the normal temperature has been reached. After this time an ordinary regimen may be gradually and carefully resumed.

DUKES'S DISEASE.

Synonym. Fourth Disease.

This affection is considered by Dukes, first described in 1900, to be an independent disease of mild character which simulates mild scarlatina, but differs from it in that its incubation period is much longer, being from nine to twenty-one days, and in its lack of prodromal symptoms, excepting possibly a slight fever. The eruption resembles that of scarlet fever except that it appears first upon the face and spreads downward. Itching is absent, it fades rapidly, and it is usually followed by profuse desquamation.

Many observers doubt the existence of this disease as a separate entity, and it is certain that, before its identity can be clearly established, further study must be made of rubella. It has been suggested that this affection may be the result of a simultaneous infection with scarlatina and rubella; this would appear untrue because vomiting, so frequent in scarlatina, is absent, and in rubella the rash is pale and in patches of irregular shape.

Its treatment is entirely symptomatic and to be based upon that of the other infectious exanthemata, particularly of a mild scarlatina.

ERYTHEMA INFECTIOSUM.

Synonym. Escherich's Disease.

Definition. A feebly contagious disease of childhood presenting a maculo-papular, rose-red rash, generally found on the face and external surface of the extremities.

Ætiology. No micro-organism has been found. The disease occurs in epidemics, generally in the summer, and an attack does not protect against the other exanthemata.

Pathology. There are no known lesions excepting the erythema and a mild pharyngitis.

Symptoms. After an incubation period of one or two weeks, the rash appears, resembling somewhat in appearance, erysipelas, but without constitutional or local symptoms. The eruption persists for three or four days then fades, the whole process lasting not more than ten days.

Diagnosis. This is based on the character of the rash which lacks the peculiarities of other exanthemata and the entire absence of constitutional symptoms.

Prognosis. There have been no deaths recorded.

Treatment. At the outset a saline should be administered and a liquid diet maintained.

VARICELLA.

Synonym. Chicken-pox.

Definition. An acute infectious febrile disease of mild type characterized by a vesicular eruption and usually seen in children.

Ætiology. The disease occurs sporadically, but from time to time epidemics are observed. It is essentially a disease of children, but adults, who are not immune through an attack in childhood, are quite likely to contract the infection. The affection is met in all climates and at all seasons, and, while its specific cause has not yet been isolated, it is presumably a micro-organism, probably a protozoön. The contagium is found in the contents of the vesicles and the disease may be reproduced by inoculation with these. The disease is markedly contagious and may be transmitted by direct contact and possibly through a third person.

Symptoms. The incubation period is from twelve to sixteen days and the eruption may be the first symptom noticed. In other instances there may be mild prodromata such as irritability, malaise, and slight fever. The invasion may be marked by a slight chill followed by a rise of temperature to 101° to 103° F. (38.5° to 39.5° C.), vomiting, headache, and perhaps general pains. The eruption appears, without other symptoms or within twenty-four hours of the invasion, upon the upper part of the trunk, generally it is first observed upon the face; often here the rash is usually scanty, but the scalp is always involved. It occurs first in the form of small reddish points which quickly become rounded rose-colored macules. These become successively papules and vesicles within a few hours. These last vary from one-sixteenth to one-half an inch in diameter and later contain turbid fluid. Usually they are not umbilicated but at times this manifestation may be observed. In about forty-eight hours from their original appearance the spots have become pustules which upon being pricked collapse entirely, which is not the case with the pustules of smallpox. The rash lasts from two to five days when the pustules begin to dry, a brownish crust resulting, which soon falls leaving no scar; in certain instances a depression is left which, however, is seldom permanent. Successive crops of the

eruption appear and the rash may be seen in all stages at the same time. If the vesicles are scratched or irritated, small cicatrices, which are round, oval, or elongated, may remain. The rash is also seen upon the lining of the mouth and pharynx, and perhaps on that of the larynx. A scarlatiniform blush may precede its appearance. The eruption of varicella is always discrete, and in mild infections there may be not more than ten to twenty vesicles upon the whole body.

The temperature falls by lysis as the rash fades and, as this occurs, the other symptoms, if they have been present, disappear. The disease in children previously healthy is very mild, but may be severe in those less fortunate. In the latter, complications, such as nephritis and paralyses, have been observed. A hæmorrhagic form of the disease with extravasations of blood into the eruption and from the mucous membranes has been described, and gangrene of the skin about the pocks and of the scrotum has been noted in strumous children. Erysipelas and adenitis are possible complications.

Diagnosis. This is not difficult. The lack of constitutional symptoms, the occurrence of the eruption in all stages at one time, the absence of umbilication of the vesicles and of a surrounding areola are characteristic. There is no induration under the skin as in smallpox. In infants the differential diagnosis between severe types of variola and mild cases of varioloid may present difficulties.

Prognosis. This is uniformly good, although in institutions and unsanitary districts the disease is prone to assume a severe type, and complications may occur, such as erysipelas, which are likely to render the recovery of the patient somewhat uncertain. Immunity is usually, but not invariably, conferred by an attack.

Treatment. Prophylaxis consists in isolating the patient if the disease occurs in institutions or other places where many children are gathered. In private practice quarantine may not be necessary unless the other children in the family are unhealthy or delicate. Quarantine, when instituted, should be continued until the last crust has fallen, the patient may then be released and his apartment disinfected; cleaning and thorough airing will usually be found sufficient.

The treatment of this disease is simple and consists chiefly in relieving the symptoms. The fever is seldom of a height to cause alarm and may be easily controlled, if necessary, by means of cold sponge baths. The headache may be alleviated by means of cold compresses. The bowels should be kept open and the skin and kidneys active. Cooling drinks may be grateful to the patient. If the eruption upon the buccal lining is painful this symptom may be relieved by rinsing the mouth with an one percent. cocaine solution. The mouth should be kept clean by means of mild antiseptic washes; catarrhal conditions of the upper air passages and glandular involvement, which may be observed in strumous children, may be combated by the means sug-

gested under the treatment of scarlatina. The itching of the skin may be, to some extent, prevented by a wash of very weak phenol solution, by applications of carbolized vaseline, ten percent. boric acid ointment in lanolin or vaseline, or a three percent. ichthyol ointment. To prevent scratching in infants it may be necessary to tie up the patient's hands in cotton wrapped about with gauze. It is important that the urine should be examined at intervals during and succeeding the disease.

It is best to keep the patient in bed during the febrile movement, and the diet should consist of fluids. Ordinary diet may be gradually resumed after the temperature has reached normal.

SMALLPOX.

Synonym. Variola.

Definition. An acute infectious disease characterized by an eruption which appears first in the form of macules, which become successively papules, vesicles, and pustules, upon the last of which crusts form which finally fall and leave permanent cicatrices.

Ætiology. This disease has existed in various parts of the earth since a very remote period. It invaded England in the thirteenth century and later was brought to America. Before the introduction of vaccination it was a common and very fatal disease, epidemics being by no means infrequent. Smallpox is very contagious, almost all unvaccinated persons who are exposed contracting the disease; instances of natural immunity have, however, been observed. A single attack usually confers immunity, but instances, in which two or three undoubted attacks have been experienced, have been reported.

The disease occurs in individuals of all ages and is especially fatal in children. Pregnancy predisposes to the infection and infants, exhibiting an active eruption of the disease, have been born of mothers who have contracted it during this period. Such instances are rare, and a child born while the mother is suffering from the infection rarely contracts it if immediately vaccinated.

Males and females are equally susceptible, but smallpox is more virulent in dark skinned races and is rapidly disseminated and very fatal amongst aboriginal tribes.

The disease is contagious throughout its whole course after the appearance of the eruption, and a few moments of association with a sufferer are a sufficiently long time to contract the infection. The contagium may be carried to great distances on clothing, in bedding, etc., and the pulverized dry crusts retain their infectivity for several years. The contagium exists in the blood, secretions, the contents of the vesicles and pustules, in the dried crusts, and probably in the excretions. Inoculation from the blood, the contents of the vesicles and pustules, and from the scabs is possible, but the chief mode of

transmission is probably by means of the pulverized crusts which are taken in upon the inspired air. The poison of the disease may be transmitted by a third person and upon the air to an unknown distance.

The severest type of the disease may be contracted from a very mild instance.

The specific cause of smallpox has been believed, for many years, to be a micro-organism, and much research has been conducted in the hope of isolating it. A bacterium has been found both in the contents of the pustules of smallpox and in the lymph of cow pox which may prove to be the cause of the disease, but in 1892 Guarnieri described the infectious agent, naming it the *cytoryctes variolæ*; and in 1903 Councilman confirmed the presence of the protozoon which exists in the epithelial cells of the cutaneous lesions.

Pathology. In addition to the typical eruption and its various modifications certain other morbid changes are found. The pustule has its origin in the *rete mucosum* just beneath the *cutis vera*. The pus focus is surrounded by a reticulum infiltrated with serum, leukocytes, and fibrin. The central area of necrosis finally dries and forms a crust which falls, leaving no scar if the process extends no deeper. If the papillæ of the true skin are involved, and they usually are, in the necrotic process, and are destroyed, the loss of tissue results in a permanent cicatrix.

The eruption may occur upon the mucous membranes of the mouth, pharynx, and œsophagus; the agminated glands of the intestine may be swollen, and a few pustules may appear in the rectum. They also have been observed upon the conjunctiva and upon the mucous membranes of the nose and larynx. The lesions, when occurring in the trachea and bronchi, take the form of ulcerating erosions rather than true pustules. In the hæmorrhagic type of the disease there may be extravasations of blood beneath the skin and mucous membranes as well as into the viscera, muscles, bone-marrow, and other tissues.

Laryngeal œdema, perichondritis and chondritis, bronchitis and pneumonia may be observed as associated lesions and myocardial degeneration may take place. Peri- and endocarditis are seldom seen, but splenic enlargement is common and the liver and kidneys are the seat of an acute degeneration (cloudy swelling). True nephritis is rare, but may occur during convalescence.

In the hæmorrhagic type of smallpox the spleen is likely to be hard and dense and the liver of similar consistency or the seat of fatty degeneration.

Symptoms. The disease occurs in three types:

(a) *Variola vera*, of which two forms are described. 1. Discrete. 2. Confluent.

(b) *Variola hæmorrhagica*, of which two varieties have been observed. 1. *Purpura variolosa* or black smallpox. 2. *Variola hæmorrhagica pustulosa* or pustular hæmorrhagic smallpox.

(c) *Varioloid* or smallpox as modified by vaccination.

(a) *Variola vera*. In the *discrete form* the period of incubation is from seven to fifteen, usually twelve days. During this period there are rarely any prodromata, but at its end the invasion of the disease occurs suddenly with one or more chills. In children a convulsion is a frequent initial symptom. There are headache backache (which is characteristically intense), and general pains with nausea and vomiting and prostration. The temperature rises rapidly to 103° to 104° F. (39.4° to 40° C.) on the first day, the pulse is rapid and tense and nervous symptoms may be manifested; even delirium

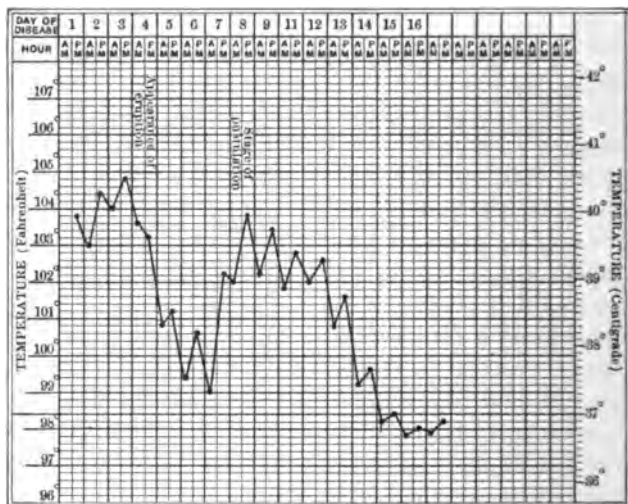


FIG. 10.—Clinical chart of smallpox showing fall in temperature upon the appearance of the eruption and its rise upon the incidence of the stage of pustulation.

may be present in severe infections. The skin is usually hot and dry, but in certain instances marked sweating may occur. The severity of the initial symptoms is no indication of the type of the disease.

About the second day the initial rash appears. It may be either diffuse and scarlatiniform or macular; while the eruption may be general it usually occurs only upon the lower abdomen, the sides of the chest, in the axillary region, and upon the inner aspects of the thighs. Hæmorrhagic petechiæ may accompany them. The scarlatinal type is the more frequent. Initial eruptions are by no means the rule, since they appear in only from ten to sixteen percent of patients.

About the fourth day the characteristic eruption of the disease appears, first upon the forehead along the edge of the hair or upon the ventral surface of the wrists, whence it spreads downward over the trunk and limbs, becoming general usually within twenty-four hours. At first it is in the form of round

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pale, reddish macules which later become darker and slightly elevated. By the second day the papules have become firm and impart a feeling to the examining finger as of shot under the skin. By the fifth or sixth day the papules become vesicles containing clear or slightly turbid serum, and umbilication is present which is a characteristic of the eruption of smallpox; by the eighth day the vesicles become pustules, the umbilication disappears, and the skin and mucous membranes become tense, swollen, inflamed, and painful. After the rash has persisted for from ten to twelve days the pustules dry and crusts form which finally fall, leaving no scars unless the deeper layers of the skin have been affected. In the latter event pit-like cicatrices of varying size and depth persist. The rash appears upon the mucous membranes as well as upon the skin.

In true smallpox there is distinct leukocytosis. At the end of the first week a count will reveal an increase to twelve to fifteen thousand; later this may fall, but at the end of the second week there is a second augmentation.

The temperature, upon the appearance of the eruption, falls rapidly, sometimes nearly to normal, but when the fluid in the vesicle becomes converted into pus the fever (secondary fever) recurs and with it the usual symptoms which accompany an abnormally high temperature appear. Not unusual symptoms of the disease are sore throat and hoarseness, due to the eruption upon the pharynx and larynx, vomiting and diarrhoea. Splenic enlargement is frequent and albuminuria may be present. As the rash dries and the crusts fall, the temperature drops and all the other symptoms abate. The patient suffering from this disease may be said to possess a characteristic odor.

In the *confluent type* of smallpox the pustules are so closely situated that they coalesce. This manifestation is particularly likely to be present upon the face. In marked instances of this type, the skin of the face and limbs is thoroughly infiltrated with pus, the temperature is high (105° F.)—(40.5° C.)—or more, and cerebral symptoms as well as other signs of a severe infection are observed. Salivation may be present, and there is enlargement of the superficial lymph glands. The appearance of a patient affected with confluent variola is most revolting. In the marked infections, from the tenth to the twelfth day the patient becomes progressively weaker, the cerebral symptoms increase in severity, and death may take place. In patients who recover the secondary fever is prolonged, depending upon the extent of the pustulation, lasting from three to four weeks. At the end of this period the pus dries and the crusts form. These, after adhering for a considerably longer period than those of discrete variola, fall.

(b) *Variola hæmorrhagica*. The *purpuric form* of hæmorrhagic smallpox is characterized by the early appearance of a hæmorrhagic rash and of hæmorrhages from the mucous membranes. The condition is a very fatal one and the patient may die even before the appearance of the papules. Hæmaturia

is common and hæmatemesis, hæmoptysis, and corneal and intestinal hæmorrhages may occur. The skin may be purplish and the patient's appearance is most horrible. The temperature may not be greatly elevated, but the pulse is rapid and small, while the respirations are accelerated out of proportion to the height of the temperature.

In *variola hæmorrhagica pustulosa* the hæmorrhages do not appear until the stage of vesiculation or of pustulation is reached. Then there are extravasations of blood into the areolæ of the pocks and later their contents become bloody. Hæmorrhages from the mucous membranes also occur. While this type of variola is very fatal, recoveries sometimes take place.

These malignant forms of the disease are much more prone to occur in the unvaccinated.

(c) *Varioloid*, or smallpox modified by vaccination or by a previous attack from the disease, is usually much milder than the unmodified disease, although the initial pains may be severe. All the symptoms are less marked and the eruption is less diffuse. Secondary fever is slight or absent, the initial fever falling and the symptoms clearing with the appearance of the eruption which matures rapidly. Permanent cicatrices are uncommon. This form of the infection, in rare instances, may be severe and even fatal. There is usually a direct ratio between the length of time intervening between vaccination and the attack and the severity of the latter.

Unusual types of variola sometimes are observed. *Variola sine variolis* or *sine eruptione* has been described, and a form of the disease known as horn, wart, or stone pox, in which the papules dry before the vesicular stage, has been noted. Another abortive form is crystalline pox in which the vesicular fluid remains permanently serous.

Complications. Those referable to the respiratory system are œdema of the glottis, inflammations of the laryngeal cartilages, pleurisy, and broncho- or lobar pneumonia. Vomiting, diarrhœa—particularly in children—and parotitis may occur. Circulatory complications are rare; myocarditis with inflammation of the coronary vessels has been observed, but pericarditis and true endocarditis are very seldom met, although during the attack of the disease a systolic murmur at the apex may be heard. Albuminuria is common, but true nephritis is rare. Orchitis and ovaritis have been described.

Cerebral complications, such as persistent delirium or coma, occur during the acuity of the infection, and post-febrile insanity and neuritis have been reported. Joint inflammations may complicate convalescence and skin manifestations, such as painful acne, furunculosis, and localized gangrene, are among the most important sequelæ.

Formerly the neglect of the eyes was responsible for various ophthalmic complications, but attention to the cleanliness of these organs has now rendered these less common. Otitis from extension of the pharyngeal inflammation may occur.

Diagnosis. This is simple after the appearance of the characteristic eruption and in the earlier stages the severe pain in the back, and shot-like feel of the undeveloped eruption and its appearance upon the forehead about the hair-line, and the rapid fall of temperature are diagnostic points. Pustular syphilides, pustular glanders and impetigo contagiosa may lead to doubt which investigation will dispel.

The catarrhal symptoms of measles and buccal spots are absent which aids one in differentiating the measles-like rash, and the scarlatinal form of initial eruption is less persistent than that of scarlet fever. In chicken-pox the rash is present in all stages at the same time and is very rarely umbilicated.

The differential diagnosis of the hæmorrhagic type from epidemic cerebro-spinal meningitis offers difficulties which attention to the character of the eruption will dispel. The only safe method is to isolate all suspicious patients until the diagnosis is confirmed.

Prognosis. This varies in different epidemics, but at best smallpox is a disease to be dreaded, particularly in children. The death rate varies from fifteen to thirty percent. In persons unprotected by vaccination it may exceed fifty percent. In varioloid it is likely to be less than two percent. Hæmorrhagic forms are generally fatal. Pregnant women are likely to abort and frequently die. Pharyngeal, laryngeal, and pulmonary complications render the infection especially serious.

Prophylaxis. The most strict isolation is absolutely imperative and, if possible, the patient should be removed to a hospital for contagious diseases. The room selected should be divested of all carpets, pictures and hangings, and all superfluous furniture should be removed. Before the door a sheet kept constantly moistened with a five percent. phenol solution should be suspended. Thorough ventilation is an absolute necessity. The nurse and physician should wear, while in the sick-room, a gown covering all the other apparel and a cap, which are to be removed upon leaving the patient. None but the attendants should be allowed to visit the patient. All bed linen and clothing should be immersed in one to one thousand mercury bichloride or three percent. phenol solution immediately upon removal and allowed to remain in the solution at least two hours before being sent to the laundry. All dressings, crusts from the eruption, and sweepings must be immediately burned and the patient should be supplied with separate utensils and dishes.

After death the body should be sponged with strong phenol or mercury bichloride solution, the mouth, nostrils, and anus having been plugged with pledgets of cotton moistened with either of these; it should then be wrapped in a sheet saturated with a disinfectant, placed in a metallic or air-tight coffin, and buried so soon as is possible. The disposal of such bodies by cremation is always to be preferred when practicable.

In the event of recovery the patient, before leaving the sick-room, should receive a thorough bath and shampoo with soap and hot water and then be

sponged off with a one to three thousand solution of mercury bichloride or immersed in a one to five thousand bichloride solution bath. He should then be dressed in a clean night dress and removed to another apartment where he may put on other clothing. The quarantine should be insisted upon until the skin is clean and smooth and no trace of the crusts remains.

Room disinfection. The disinfection of the sick-room and its contents depends upon the means at hand. If a steam disinfecting plant is conveniently situated the bed, bedding, and other fabrics should be made into bundles, wrapped in clean sheets and removed for steam disinfection. By care in transportation such packages may be transferred with little danger. The bedstead, furniture, and wood work must be carefully washed with a soft cloth wet with a one to one thousand mercury bichloride or three percent. solution of phenol. All cracks and crevices should receive studious attention. The removal of superfluous objects greatly simplifies the disinfecting process. The walls, if painted, should be treated in the same manner as the wood work; if papered they should be thoroughly rubbed with pieces of bread, then, if practicable, the old paper should be removed and burned and the walls repapered. After attention to these details all the windows and the doors, with one exception, should be closed and sealed by pasting strips of paper with common flour paste over all the cracks. The sealing process is important, for upon the tightness of the room depends, in great measure, the efficacy of the disinfection. If the cracks allow the escape of the disinfecting gas, the process is of little value. Before sealing the last door all draperies which have not been removed must be spread out and all drawers, closet doors, etc., widely opened.

Sulphur dioxide or formaldehyde gas may be used to disinfect the room. If the apartment is bare and contains little decoration the former may be employed; if the reverse is the case the latter is to be preferred. If sulphur disinfection is chosen, four pounds (2000.0) must be used for each thousand cubic feet of room space. A simple method of generating the gas may be arranged as follows: Two or three bricks are laid upon the bottom of an ordinary wash tub and upon these is placed a dish-pan or other metal receptacle which is to hold the sulphur. The tub should contain enough water to cover the bricks and the bottom of the pan, so that there shall be no danger of fire. For this reason the vessel which holds the sulphur must never be placed upon the floor. The sulphur is to be broken in small pieces, over which alcohol is poured and set on fire by touching a match to the mixture. The operator should stand at as great distance as possible while applying the match. If enough alcohol is used the sulphur will be almost entirely consumed, and it is important that the pan should not contain too much sulphur, as in this case the combustion will not be complete. On this account it is better to use two or more pans for the sulphur if the room is large. To produce proper disinfection it is necessary that moisture be present, and to



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provide for this, unless the weather is damp, we must supply the deficiency. This may be done by boiling water over a gas stove or by pouring boiling water from one vessel into another in the room just before the disinfection is begun. Another method is to place a vessel of water a few inches above the burning sulphur. The sulphur should always be prepared so that it may be at once set on fire after the moisture has been supplied. After lighting the sulphur the room should be immediately closed and the door of the exit sealed as described above.

If formaldehyde gas is employed it may be generated from tablets in a specially designed lamp or generated from formalin in an apparatus which sends the gas rapidly through a tube passed into the keyhole of a door. The latter method is preferable but less practicable than the former.

Whichever method is chosen the room should remain sealed for at least eight hours. Even at the end of this time care must be exercised in entering the apartment and in so doing one should wrap the face in a wet towel, pass quickly to a window and open it, allowing the gas to escape and the fresh air to enter.

Since the discovery of vaccination by Jenner, in 1796, we have had at our disposal a practically absolute preventive of smallpox, and since that time the disease has become a rarity in districts in which the procedure has been systematically instituted. Consequently too great insistence cannot be laid upon the necessity for the routine performance of the operation. All children should be vaccinated at from three to five months of age, every seven years thereafter and in the intervals whenever smallpox is prevalent; one should never be satisfied with an unsuccessful attempt. While vaccination does not always protect, the disease, as it occurs in those who have undergone the operation, is very rarely severe.

Treatment. Since no means exists of shortening the disease when once infection has taken place, the treatment is to be directed towards the control of the symptoms and the prevention of permanent scarring. At the onset the patient should be isolated and put to bed in an airy room, the temperature of which should be kept constantly at about 65° F. (18.5° C.), and the bowels should be opened by repeated fractional doses of calomel or other mild laxative, to be followed by a saline, if necessary. The symptoms of the first stage which need special attention are the pain, the vomiting, the diarrhoea, and the cerebral manifestations. The pain may be relieved by the administration of acetphenetidine, acetanilide, or antipyrine salicylate, usually in combination with caffeine to prevent cardiac depression. Morphine may become necessary in severe instances. The ice cap to the head and the application of an analgesic liniment, such as equal parts of menthol, hydrated chloral, and camphor, may prove beneficial. The vomiting may be controlled by swallowing small pieces of cracked ice, by minute doses of phenol, hydrocyanic acid or cocaine, or by frequent sips of iced champagne, and the diarrhoea by

means of bismuth naphtholate in five grain doses (0.30); bismuth subsalicylate or subgallate in connection with small doses of opium may also be employed to relieve this condition. The nervous symptoms may be rendered less distressing by potassium or sodium bromide or hydrated chloral, any of which may be given *per rectum* as well as by mouth. Sulphonmethane is also useful and in the extreme instances the employment of morphine or opium in small doses may be necessary.

Cool sponging, tepid tub baths and the ice cap are also useful in the treatment of the cerebral manifestations.

The temperature is seldom high enough or of sufficiently long duration to cause alarm, but, if necessary, it may be reduced by the application of the ice coil over the precordium or by cool sponging. Rarely is cardiac weakness an early symptom but, should this be the case, stimulants, such as caffeine, alcohol or strychnine, may be given hypodermatically.

The dryness of the mouth will be alleviated and the activity of the skin and kidneys will be favored by frequent cold drinks or cool acidulated ones which should be offered at intervals.

The eruptive period. During this stage the problem confronting us consists of two parts, the treatment of the cutaneous manifestations and that of the constitutional condition. In the former the chief object is to prevent permanent scarring, and numerous methods have been employed with this end in view. Of these the simplest and one of the most efficacious is to cover the skin with a thin gauze compress which is kept moist with cold one to five or ten thousand mercury bichloride or one to two or three hundred phenol solution and is covered with oil-silk. For the face a suitable mask can be made. The phenol has the especial advantage of neutralizing the unpleasant odor of the disease. The wet compresses have a certain analgesic effect and are grateful to the patient. Clipping of the hair is necessary if the eruption involves the scalp to any extent. Of other means of treating the skin the employment of wet dressings of weak thymol or potassium permanganate solutions may be mentioned. Many more drastic applications have been advocated, such as touching the points of eruption with pure phenol, painting with silver nitrate solution or half-strength of iodine tincture, and even opening the pustules and touching them with pencils of silver nitrate, but none of these is likely to yield better results than the simple cold wet compress.

Dusting powders have a place in the treatment of the eruption, especially in its early stages. Of these boric acid, bismuth subgallate, talcum, or a mixture of phenol one part and lycopodium powder and zinc oxide, of each sixteen parts, are to be recommended. Burned calcium sulphate, finely powdered, has been recommended by Zdanowitsch for confluent forms of the disease. It diminishes the foul odor absorbs the pus and prevents its decomposition, lessens the itching and consequently the scratching, and thus miti-

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gates the scar-formation. Scrub baths, given daily, are said to prevent pitting since they hinder the formation of the vesicles and pustules; they are, however, a drastic measure. Continuous warm baths have also been advocated.

The variolous manifestations in the nose, mouth, and throat require the external application of cold and moisture and attention to the cleanliness of the nasal and buccal cavities. Antiseptic sprays and mouth washes such as diluted liquor antisepticus are useful here, and astringent washes such as dilute solution of potassium chlorate or iron perchloride may be employed. The discomfort attendant upon the appearance of the eruption in the mouth may be alleviated by means of sucking bits of ice and by emollient and demulcent drinks such as thin oatmeal gruel and teas of arrow-root or marsh-mallow. If ulcers appear they may be touched with a twenty percent. silver vitellin (argyrol) solution. Localized collections of pus in the pharynx or tonsils should be immediately opened and drained.

The conjunctival eruption should be carefully treated by means of continuous compresses of cold boric acid solution (one-half saturated) and by instillations of a few drops of a ten percent. argyrol or of an one to five hundred methylthionine hydrochloride solution. Silver nitrate solution may be used but is painful and no more efficacious than the silver vitellin. If the eyelids tend to become gummed together this may be prevented by anointing their margins with vaseline, either plain or containing five percent. of boric acid. Great care must be exercised and constant watchfulness lest keratitis supervene which is likely to leave serious scars or even result in blindness.

After the crusts have formed the patient should be advised to let them fall spontaneously, for if they are removed before they are wholly loosened the pitting is apt to be more pronounced. Children should be prevented from scratching by bandaging their hands loosely in gauze. The itching during the period of crust formation may be relieved by means of the dusting powders previously suggested or by warm baths to which bran may be added and the scabs may be protected from irritation by means of light dressings of carbolyzed vaseline, or vaseline containing five percent. of boric acid. If the scabs for any reason become detached before the skin beneath has wholly healed, the suppurating surface should be cleansed with a mild antiseptic solution and dressed, until the skin has reformed, with borated vaseline. Exuberant granulation tissue should be touched with silver nitrate pencils and dressed antiseptically.

The treatment of the constitutional condition during the stage of pustulation offers several problems. The strength of the patient must be maintained by proper and sufficient nourishment and the pyæmic condition necessitates the employment of measures such as are indicated in suppurative states due to other causes. Here alcohol in the form of brandy or whiskey, two to four

ounces (60.0 to 120.0), and infusum cinchonæ in large doses are highly recommended. The former may be given either diluted with water or in the form of a milk punch with egg; to the latter a few drops of dilute hydrochloric acid or spirit of nitrous ether may be added with advantage. The fever seldom needs especial treatment, but should it be alarmingly high the application of an ice coil to the precordium will usually result in a considerable reduction. The coal tar antipyretics should be employed with great caution if at all. The condition of the heart should be carefully watched and should stimulation be required in addition to the alcohol, strychnine and caffeine may be given in appropriate doses, and should there be evidence of collapse, hypodermatic injections of camphor dissolved in olive oil or ether become necessary. Nervous symptoms may be controlled by the bromides and hydrated chloral which may be given by rectum or by mouth as indicated. The dose of the latter must be such as to be in no danger of causing heart weakness. Tepid baths are also useful in relieving the nervous hyperexcitability.

In the later stages of the disease bed-sores and even abscesses are likely to develop; to prevent these a water-bed may be necessary.

The administration of antistreptococcus serum has been suggested as a means of combating this stage of the disease and not without reason, since the presence of the streptococcus in the contents of the pustules is common. This procedure is especially indicated in patients with grave septic symptoms; fifteen drachms (60.0) may be given in three doses twenty-four hours apart, or in profoundly toxic instances this quantity may be given in one day. Attempts at controlling hæmorrhages may be made by giving ergot hypodermatically or better by the internal or rectal administration of calcium chloride. The latter exerts a distinct influence in increasing the coagulability of the blood and may also be given in hæmorrhagic forms of the eruption. Its dose is forty grains (1.30) once daily. It should not be given for more than three or four days at a time.

The treatment of the complications is little different from that of similar conditions occurring independently. Œdema of the glottis may demand scarification, intubation, or tracheotomy. Pneumonia should be prevented by careful management of its precursor, bronchitis, and by frequent turning of the patient upon his side to prevent hypostatic congestion of the bases of the lungs. Pharyngeal suppuration and furunculosis necessitate appropriate surgical treatment.

The treatment of smallpox by means of red light has recently been advocated, especially by Finsen, who considered the omission of this method to be little less than criminal. The idea is not new, having been exploited by John of Gaddesden in the fourteenth century, who wrapped his patients in red flannel. According to this author, who excluded the ordinary daylight by means of panes of red glass, daylight and particularly its chemical rays have an injurious effect upon the course of the disease since the suppuration of the

vesicles is brought about by exposure to unchanged sunlight. Upon the infection *per se* the light seems to exert no action. The avoidance of suppuration, however, is most important, since the stage of pus formation is the most dangerous epoch in the disease and many fatalities result primarily from the suppuration. The method must be properly and systematically employed, but, if pus formation has already taken place or is about to begin, the red light will not abort it. He considered that in ordinary epidemics this treatment will reduce the death rate by one-half. Many other observers have used the red light treatment with good results while still others are much less enthusiastic in its advocacy.

Other methods of treatment have been recommended with enthusiasm, among which may be mentioned that by means of intestinal antiseptics such as the phenolsulphonates, phenyl salicylate (salol), mercury bichloride, etc., and that of Talamon who applies a spray to the skin composed of mercury bichloride and tartaric acid, of each fifteen grains (1.0), alcohol (90 percent.) one and a quarter drachms (5.0), and ether to an ounce and a half (45.0). With this the skin is sprayed for one minute three times a day, the eyes being protected. The surface is first washed with soap suds, rinsed with boric acid solution and dried with cotton. The treatment is begun with the appearance of the rash, and after spraying, the face is covered with fifty percent. mercury bichloride glycerite. After four days the spray is used less often, and after a week it is discontinued, the glycerite dressing being continued. The same observer has recommended, in the confluent type of the disease, general baths of mercury bichloride solution lasting forty-five minutes to one hour, internal stimulation being employed at the same time.

The specific serum treatment of smallpox has thus far given no results which render its use justifiable. Further advance in the elaboration of an efficient serum therapy may be made in the future.

The convalescence usually necessitates the employment of tonics and of easily digestible and nutritious food.

The diet of smallpox should be carefully regulated. During the initial fever only fluids should be allowed but in the remission, before the stage of pustulation, semi-solids such as gruels, soft-boiled eggs, meat jellies, etc., may be given. At the onset of the stage of pustulation the patient must return to fluids; it is at this time particularly necessary to maintain his strength, consequently the diet should be as concentrated and nutritious as possible.

VACCINIA.

Synonyms. Cow Pox; Vaccine Disease.

Definition. An infectious disease characterized by an eruption and produced in man by inoculation with the contents of the vesicle of cow pox. Individuals who have been successfully inoculated are, with a very few

exceptions, immune from smallpox, and, even if able to contract the disease, such subjects are affected with its mildest form, varioloid.

Whether vaccine disease is a separate disease or is the variola of the human being as manifested in the cow is a disputed point, opposite views being held by different observers; the probabilities are, as Copeman suggests, that variola and vaccinia have both descended from a common stock—from an ancestor, for instance—which resembled vaccinia far more than it resembled variola. One fact is certainly evident, however, to the unprejudiced, and this is that, could vaccination be systematically and thoroughly carried out, smallpox would become an unknown disease. Unfortunately certain fanatics oppose the compulsory performance of the operation and, until these experience a change of heart and compulsory inoculation is instituted, instances of variola will be seen from time to time and, where a proper soil is offered, epidemics will occur.

That inoculation with cow pox was a sure preventive of smallpox was discovered and proven by Edward Jenner, of Gloucestershire, England, in 1796.

While, in all probability, vaccine lymph contains a specific micro-organism which is responsible for the train of symptoms which follows inoculation, it is likely that an organism, a protozoön named by Guarnieri the *cytocyclus vacciniæ* which is found in the lesions, is the essential cause of the disease, vaccinia.

In inducing vaccinia in the human being and rendering him subsequently immune to smallpox infection two varieties of virus are employed, the humanized and the calf lymph. The former is the pus from the pustule of a vaccinated human being, the latter is the contents of the pustule of the cow or calf. The latter is chiefly used at present and is preferable since the humanized virus is capable of transmitting syphilis to the inoculated person should the individual from whom the virus has been taken be unfortunate enough to be infected with specific disease. While the possibility of the transmission of tuberculosis in the same way has been considered it has never been proven.

The operation of vaccination is performed as follows: The site selected is, in the case of boys, the outer side of the arm at the junction of its upper and middle thirds. In vaccinating girls in the upper walks of life it is preferable to use the outer side of the calf. The skin over the part chosen should be sterilized by washing with soap and water, alcohol and one to five thousand mercury bichloride solution, cleansed with sterile water and allowed to dry. Then with a needle, which has been sterilized by heating in a gas flame, a surface one-eighth to one-fourth of an inch in diameter is lightly scratched, care being taken not to draw blood, but merely to remove the upper layers of the integument. A slight exudation of serum will follow this procedure and into this the vaccine should be rubbed for several



moments. The surface should be allowed to dry and then dressed lightly with a compress of sterile gauze. The various shields sold to cover vaccination wounds should not be used. Different makers supply dried vaccine upon quills or ivory points, which may be used instead of the needle to abrade the skin. When from a reputable firm these may be employed. The Boards of Health of certain cities furnish calf lymph put up in glass tubes and packed with a needle, a bit of wood, and full directions for the performance of the operation.

Symptoms. Shortly after the inoculation there is a slight inflammatory reaction at the site of the abrasion which lasts but a short time. If the procedure is successful and the vaccination takes, after a period of incubation, usually occupying three days, a small red papule appears, by the fifth to the seventh day this becomes an umbilicated vesicle surrounded by a pink areola and containing a viscid transparent fluid; by the tenth day the areola is more marked and the fluid has become purulent. The skin surrounding the pustule is often indurated and tender. Now the inflammation gradually subsides, the contents of the pustule begins to dry; about the fourteenth day a brownish crust forms which becomes hard and dry and falls about the twenty-first day, leaving a roundish depressed scar which is red at first but finally becomes whiter than the surrounding skin.

In many instances constitutional symptoms accompany the evolution of the vaccinal pustule. These vary from slight malaise and irritability with rise of temperature about the third day to marked prostration with a febrile movement lasting from one to two weeks; with this there are headache, gastric disturbances, restlessness, etc. The number of white blood cells is increased and enlargement and tenderness of the axillary or inguinal glands, depending upon the site of the inoculation, occur.

The duration of the immunity conferred by vaccination varies in different individuals, but it is best to revaccinate every seven years and at other times whenever epidemics appear. After from ten to fifteen years a second vaccination is usually successful, but the pustule and the constitutional phenomena are less characteristic. Even in first inoculations the typical result may not be attained. In such instances the operation should be performed again and repeated until success crowns the effort.

Generalized vaccinia is rare but may manifest itself as a pustular rash on different parts of the body, appearing on the eighth to the tenth day; the pustules are most abundant upon the vaccinated limb and may continue to appear for several weeks. The disease may prove fatal in children.

Complications. Cellulitis may occur, especially in debilitated children, as a result of contamination at the time of operation or subsequently and may necessitate the employment of radical surgical measures. Erysipelas is a serious complication, and great care should be used in vaccinating if the disease is prevalent. If the disease exists in the family of the subject

about to be vaccinated the operation should, if possible, be postponed. During the evolution of the pustule various skin eruptions may appear and, in certain instances, dormant diseases, such as tuberculosis and hereditary syphilis, have manifested themselves.

The occurrence of tetanus as a complication has been noted in a number of instances most of which were inoculated with lymph from one particular producer. The possibility of such contamination should render us especially careful to use lymph from reliable sources only.

Treatment. This is wholly symptomatic. Mild instances need no treatment whatever. Those in which the constitutional manifestations are unusually severe should be kept in bed and on a fluid diet during the febrile movement. The bowels should be kept open and the kidneys and skin active. The local condition and the glandular swellings should be treated in accordance with proper surgical methods and for the complications the means ordinarily applicable should be employed.



CHAPTER II.

CONSTITUTIONAL DISEASES.

GOUT.

Synonym. Podagra.

Definition. A painful constitutional disease, acute or chronic, due to an abnormal quantity of the antecedents of uric acid in the blood, resulting in various symptoms, of which joint inflammation is the most prominent and characteristic, together with the deposition of urates in the neighborhood of the articulation.

To Wallaston's discovery in 1797 that the deposits at and around the joints were composed of urates we date our knowledge of this disease and its pathology.

Ætiology. In many individuals there is an hereditary tendency but the disease may also be earned. In more than half the patients a family history is obtainable.

The disease is more frequent in males than in females, and it is through the male line that the hereditary tendency is more likely to be transmitted. Gout is seldom seen in young subjects and usually shows itself after the age of forty. The stigmata, however, of the gouty diathesis may be detected as early as puberty. The most common causes of acquired gout are excessive eating, particularly of meats, and intemperate use of alcohol, combined with sedentary habits, yet these factors are by no means essential to its occurrence. It is also true that not all who possess the hereditary tendency suffer for the indiscretions of their forbears, for proper mode of living may act as a preventive.

Over-drinking is a chief factor in the production of gout, but the form in which the alcohol is ingested has a certain influence on the incidence of the disease. Heavy ales and beers, such as those brewed in England, are more likely to bring on gout than are the lighter malt liquors produced in America and Germany. Whiskey is less to be avoided in this connection than heavy wines, such as port. It is probable that the excessive carbohydrate content of these beverages is the causative factor of the disorder, resulting, as it does, in the products of acid fermentation, which, upon absorption, render the blood less alkaline and less solvent of uric acid.

Lead poisoning may excite an attack of gout, possibly, as suggested by Haig, because it may reduce the alkalinity of the blood.

Local traumatism to a joint, or even pressure from footwear may bring on

an attack in the injured part. The reason of the predisposition of the disease to attack the great toe joint is unknown.

Pathogenesis. With regard to the pathogeny of gout there is much difference of opinion, but most authorities unite in believing uric acid to some extent a causative factor. Whether this substance causes the train of symptoms known as "gouty" by its increased production in the body, by its diminished excretion, or both, is not certainly known. We are not unanimous in thinking that the sodium bi-urate which forms the tophus is the cause or the result of the pathologic process, but Roberts' theory that uric acid normally does not as such circulate in the blood, but only as a soluble quadri-urate of some base, is probably correct. In normal urine, uric acid is always present in the form of sodium, potassium, or ammonium quadri-urate. These are unstable salts and in the presence of the normal sodium chloride solution of blood or lymph become converted into the more stable and less content bi-urates. In health the quadri-urates are too soon removed to become converted. Evidently, therefore, in gout, something delays excretion long enough for them to be changed into bi-urates, and this takes place in those tissues, such as the synovial fluid, the cartilage, and the fibrous tissues, which contain the greatest proportion of sodium salts. The tophi, therefore, occur first where there is plentiful synovial fluid, then in the cartilages, and then in the fibrous tissues.

If we consider all sorts of conditions, presenting more or less resemblance to gout, as phases of this disease we have a sort of anchorage, but one which permits of much deviation. If we examine the various statements made as to the disease we may find the following fairly representative. In gout we have a disease which may give rise to almost any symptom or affect almost any organ or function. If we start with the patient the following has been presented: The gouty individual is one whose general metabolism is unstable and this instability may be present in one or more of the great physiologic systems (digestive, circulatory, nervous, etc.). If these statements represented the actual state of our knowledge, one might readily assume that we had abandoned our anchorage and were adrift. Recently, Woods Hutchinson has offered the following statement as a solution of the difficulties which beset us, defining gout as "a disturbance of health associated with the presence of excessive amounts of urates in the urine." The merit of this definition lies in its presenting a material point from which we may start. It fails to state what the *corpus delicti* is, although deductively it is not uric acid. It fails because it does not embrace within its limits those instances of undoubted goutiness in which the presence of excessive amounts of urates in the urine is inconstant, and it proves too much, because leukæmia and the renal infarcts of the newly-born are included by the definition, but are admittedly not involved in the question, so far as the symptomatology is concerned. However, as a starting point this statement is useful, and an effort will be

made to find a working hypothesis upon which we may base a plan for relief of symptoms and disabilities conquest upon disturbed metabolism.

Uric acid for over a century has at once been the base and capstone of all pathologic theory with regard as gout. At present we are in better position to reach a practical working basis for therapeutics. 1. We are reasonably certain that uric acid, as such, is not toxic. This fact is now almost universally conceded. 2. The presence of a uric acid sediment in the urine does not of necessity indicate a gouty tendency, for the power to hold uric acid in solution in the urine depends largely upon the amount of pigment and the percentage of salts contained in that excretion. 3. A nitrogen-free diet does not cause an abolition of uric acid excretion. And finally, 4. The excretion of uric and phosphoric acid goes on hand in hand—at least during attacks.

Examining these propositions *seriatim* we see that, while uric acid *per se* is not toxic; it is quite possible that earlier and less oxidized bodies are so. Therefore the increased excretion of uric acid, signifying the increased or complete oxidation of uric acid antecedents and their elimination as uric acid, should be accompanied by a relief of symptoms referable to the presence of these antecedent bodies in the organism. In practice this is found to be true. Next, the observation of coincidence of marked symptoms and diminished uric acid excretion with periods of relief and increased uric acid excretion points out that delayed or imperfect excretion of uric acid is concomitant with exaggerated pathologic conditions. Since, as has just been stated, uric acid is not in itself toxic, its forbears must be responsible for the symptoms. As a nitrogen-free diet is not followed by an absence of uric acid from the urine, the formation of uric acid in the body from substances contained therein must be conceded. This uric acid is very properly termed endogenous and is independent of the character of the food ingested. It is the exogenous uric acid, the amount varying with the food and modified by various factors which act on digestion and absorption, when the patient is on ordinary diet, that completes the other portion of the total uric acid excretion. As uric and phosphoric acid excretion bear a fairly constant relation to one another, the clue is at once given as to the probable source of endogenous uric acid. This source is the cell nucleus and the products of their destruction are both uric and phosphoric acids as they appear in the urine. Therefore the breaking up of these nuclei gives rise to the appearance of uric acid and the xanthin bases, which, as a group, constituting the alloxur bodies, are termed purins because they all contain the radical C_5H_4 .

Since the phosphoric, goes hand in hand with the uric, acid excretion, it would be as logical to direct therapeutic attention to the former as to the latter. So far as the endogenous uric acid is concerned we may define gout as a toxæmia of varying causation, accompanied by the formation of an excess of urates, this excess being due to the breaking down of the leukocytes and fixed cells in the attempt to neutralize the poison.

Now as to exogenous uric acid; obviously this comes from without and constitutes the source of the smaller moiety of the total output of uric acid. Here the ingestion of food, either purin free or of small purin content, must be considered. Obviously, were the attempt made to regulate the diet according to the amount of purin-nitrogen found in food, various articles of food would be permitted which experience has shown to be detrimental to the patient. And after all, the patient must not be disregarded, for the metabolic reactions of the gouty are indubitably abnormal. From this it is clear that an attempt to regulate the output of exogenous uric acid by altering the intake of purin-containing substances must be futile when we consider that there are factors influencing metabolism in the gouty which are important.

Recently there has been a tendency on the part of some observers to return to the mechanical theory of gout. This theory advances the idea that the urates deposited in the joints and the ligamentous structures about them act as foreign bodies, obstruct the lymph vessels, cause irritation, and exert pressure upon the articular and peri-articular tissues and interfere with their nutrition, thus explaining the pain, redness and swelling and accounting for the degenerative manifestations which result later. Old deposits of the bi-urates are not of necessity painful, but it is the opinion of most observers that fresh deposits of these substances are always accompanied by painful symptoms.

Pathology. While there are few organs or tissues which may not be the subject of gouty changes, the characteristic manifestation of the disease is in the acutely inflamed great toe, the swollen and reddened appearance of which has but to be but once felt or even seen to be always remembered. Less usual is a like condition of the thumb.

The manifestations of chronic gout are less typical and may be difficult of differentiation from those of chronic rheumatism. Deposits of the urates, however, are pathognomonic of gout. These occur with greatest frequency in and around the joints, involving the cartilages, ligaments, tendons, bursæ and last of all the skin and connective tissue. Often we find the tophi about the finger joints or in the aural cartilages. Upon microscopic examination the cartilages are seen to be infiltrated with sodium bi-urate crystals. The tophi may ulcerate through the skin of the knuckle joints and they are frequently accompanied by a tendency of the fingers to be drawn to the ulnar side and of the toes toward the outer side of the foot; this latter being a late manifestation and frequent, as well, in arthritis deformans and a result of the fact that the abductor muscles are more powerful than their antagonists. The tophi should not be mistaken for Heberden's nodes which are of different origin and occur in arthritis deformans. These are, however, more prominent and painful in gouty subjects. Various exostoses and enchondromata or "lippings" from the cartilage covering the articular extremities of the

bones, especially of those of the fingers and toes, may be observed but should not be confounded with true tophi.

The kidney of gout is the granular or sclerotic kidney and is not in any respect different from the ordinary kidney of so-called chronic interstitial nephritis.

The heart is often the seat of an hypertrophy, especially of the left ventricle, and its valves may show deposits of urates upon their edges. The arteries are usually sclerosed, which fact is due to the toxic influence of the xanthin bases.

Symptoms. Patients in whom attacks of gout are frequent often are able to foretell a coming attack, learning from experience that certain symptoms, which differ in different individuals, are premonitory; headache, neuralgic pains, disordered digestion, cardiac irregularity or palpitation, a tense pulse, a feeling of weariness, depression, etc., may be mentioned in this connection.

Any circumstance which tends to lower vitality, as intemperance in eating or drinking, may bring on an attack. A period of severe mental strain or of great anxiety is likely to precipitate an outbreak.

Usually the first symptom noted by the patient is a pain in a joint, usually in the metatarsophalangeal articulation of the great toe. Its onset is sudden, and its character is sharp and stabbing. A chill may usher in the attack. Accompanying the pain are the symptoms of local inflammation; heat, redness, swelling, and tenderness, although there may be pain without these manifestations, or there may be local signs with discomfort. The attack usually begins at night and, if the first, it may not be typical and therefore remain undiagnosed. As morning comes on the pain becomes less, perhaps to recur during the night following, and for from four days to a week the cycle continues—worse at night, better during the day. With the attack there is commonly a moderate rise of temperature (100° to 102° F.)—(37.8° to 38.4° C.), which may continue, with morning remissions, as long as the acuity of the symptoms persists. After a few days the pain and other symptoms subside and the skin of the affected part desquamates.

The urine during the attack is scanty, high in color and specific gravity, may contain a little albumin, and, if allowed to stand, is likely to show a sediment of urates and uric acid. Glucose also may be present. After the attack the amount of uric acid excreted through the urine may be increased (so-called lithuria); before its onset and during its acuity this may be diminished.

Gouty pharyngitis may be the only manifestation of an acute attack and is impossible of differentiation from other forms of sore throat which show only redness and slight swelling.

The local symptoms of an attack of acute gout may suddenly disappear, and manifestations due to derangement of the internal organs—notably the

stomach, heart, brain, or bladder—may as suddenly appear. In such instances the gout is described as “retrocedent” or “metastatic.” The symptoms referable to the heart may be pain, dyspnoea, or irregularity of action; those referable to the stomach, pain, vomiting, or diarrhoea; those referable to the brain, various meningeal disturbances; and those referable to the bladder, those of inflammations of that organ or of the prostate gland. Skin eruptions (eczemas) have been described in this connection.

Atypical Gout. Certain symptoms not distinctive of gout may appear in persons of gouty tendency and in such patients are of undoubted gouty origin. These include almost any mentionable symptom; of them the most usual are various muscular pains, headaches, digestive disorders, burning and tingling of the palms and soles, and *digiti mortui*.

Certain changes, not characteristic, occur in the organ of vision as a result of the disease—except rarely, in patients in whom there are deposits of the urates in various tissues of the eye.

Chronic Gout. When a patient has continued to have numerous attacks of gout changes take place in his tissues—as described in the section on pathology—such as the deposits about the joints and in the cartilages, the deformities of the extremities, and the morbid degenerations of the kidneys and blood-vessels.

Diagnosis. Gout is easily distinguished from acute articular rheumatism unless it should happen to show itself as a polyarthritis. In gout, points of greatest tenderness are over the condyles of the joints, elicited by transverse pressure. On the contrary, in rheumatism the tenderness over the skin is greater as well as over the tendons anterior and posterior to the joints (Thomson’s sign). In chronic forms of both diseases gout chiefly involves the small, but the large joints are the seat of rheumatism. Arthritis deformans often presents difficulty, but the fact that this disease has chiefly nervous causes, affects females and generally the lower orders, commences in the fingers, is generally symmetrical and progressive results in deformity of the bones, and rarely is complicated by the conditions common in gout, will establish the correct diagnosis.

Treatment. The treatment of gout resolves it into the management of the acute attack, and that of the gouty tendency, to be considered later.

When the attack occurs in a healthy person, in whom there exists no reason for limiting our efforts, the indication is to prescribe the drug or drugs which will most quickly relieve the patient of his misery. Colchicum will relieve the pain, and in the salicylates we have agents which will hasten the elimination of the purin bodies which are the *causa causans* of the attack. The following capsule is recommended: \mathcal{R} , colchicinæ salicylatis, gr. $\frac{1}{16}$ (0.006), methylis salicylatis, $\mathfrak{m}\text{vi}$ (0.4); make one capsule. *Signa*—Take one every hour until pain is relieved.

When the acute symptoms have abated the indication is to relieve the

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Zolner's method
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for protein basis
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system of the accumulated purin bodies and to prevent their further retention. (See treatment of chronic gout and purinæmia, p. 275.)

In patients who have suffered frequent and repeated attacks of gout and whose heart and arteries are the seat of sclerotic changes, glyceryl nitrate (nitroglycerin) one one-hundredth to one-fiftieth of a grain (0.0006 to 0.0012) and strychnine one-thirtieth to one-twentieth of a grain (0.002 to 0.003) at the interval required by the severity of the degeneration, should be prescribed to dilate the arteries, so far as is possible, and to counteract the depressant effect of the colchicine.

There is no reason why an attack of acute gout should not be cut short for there is no danger of the disease "going to the heart" unless we fail to open the arteries and to provide against the myocardial degeneration.

The use of nucleinic acid in the treatment of the uratic deposits has been suggested, and favorable results are reported. Nuclein substances, themselves, since they contain abundant purin bases, are not suitable in this connection. Base-free thymic acid has been used in attempting to lessen the size of the tophi, which seem to diminish under its influence, while the excretion of uric acid is increased.

Quinic acid, particularly quinic acid anhydride, may be used in acute gout in doses of one hundred and fifty grains (10.0) per day. It is reported that by its administration the pains are greatly ameliorated and the local signs about the joints are lessened. This substance regularly diminishes the output of uric acid.

Certain authorities recommend hypodermatic injections of antipyrine in the neighborhood of the affected joint, since this drug, in addition to its analgesic effect, is said to have a specific action in gout.

The wine of colchicum seed, in beginning dosage of one-half drachm (2.0) in combination with potassium iodide or sodium salicylate, but not administered at the same time, is frequently used in acute as well as in chronic gout, the dosage of the two latter being up to one drachm (4.0) a day in divided doses. After the paroxysm it is best continued at longer intervals, and lithium citrate, seven grains (0.5) thrice daily, also administered well diluted with water.

For the pain acetphenetidin (phenacetine), antipyrine salicylate (salipyrine), and saligenin tannate have their advocates. Hypodermatic injections of morphine will always relieve, but these should not be given unless absolutely necessary.

The insomnia may be controlled by the bromides or hydrated chloral.

The diet during the attack should consist entirely of milk and Vichy, equal parts. Of this eight ounces (250.0) should be given every two to four hours. This tends to act as a diuretic and to cause the colchicum to be absorbed into the circulation rather than to be excreted through the intestine without accomplishing the effect for which it is administered. It is very important

that the patient should drink copiously of water. During the interval the diet should be regulated for the patient and not according to the disease. Even contrary to accepted practice, an emaciated gouty subject will often thrive upon a generous diet provided alcohol be omitted and the amount of meat be limited. Green vegetables of all kinds, fruits, excepting the acid ones, farinaceous foods, excepting oatmeal, provided that they be not taken with an excess of sugar and liquids, and milk, beef and mutton in moderation, sea-food, excepting the salted, fowl in moderation and never the cold-storage kind, with sufficient fat, as unsalted butter, to two ounces (60.0) give a sufficient variety. All fried, salted and made-over dishes should be avoided. Milk and Vichy or Selters, coffee with milk only in the morning, with plenty of plain water midway between meals furnishes sufficient liquid. Some patients will do well upon an animal diet, but a mixed diet is usually preferable. Wheat bread and pastry, sweet desserts and highly seasoned viands and rich sauces should be interdicted. About the only wine allowed is a dry champagne of established vintage and not the brands advertised so freely, in small quantity, and a Burgundy in limited amount. The best natural mineral waters are those of Vichy and Kissingen and some of those in the United States which are feebly mineralized. The patients, if amenable to discipline, are best cared for at home.

Local treatment The joint should be protected by a generous swathing of cotton, and various local applications, warm rather than cold, may be made, always remembering that it is very important that the skin should be kept intact. Painting with collodion (not more than two coats), either with or without the tincture of iodine, may afford relief as may also any of the following applications. Sodium bicarbonate, one to sixteen of warm water; equal parts of guaiacol and glycerin; one part of the extract of belladonna to eight of glycerin; oil of peppermint; chloroform and olive oil, equal parts; belladonna liniment and chloroform, equal parts. Local applications are likely to afford less relief than in rheumatism and are less effective cold than warm. At times the tenderness is so marked that not even the bed clothing can be borne upon the afflicted part; in such instances the use of a frame to support the sheets is advisable.

PURINÆMIA.

Synonyms. Lithæmia; Uricacidæmia; Uricæmia; American Gout; Goutiness.

Definition. A disease of rather indeterminate nature dependent upon the presence in the blood of partially oxydized food elements more especially the purin bodies.

Ætiology. The condition is caused by intemperate eating and the abuse of alcohol, combined with too little exercise and a sedentary habit of life.

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The accumulation of the urates and their forbears is rather due to their production within the body as a result of faulty metabolism than to a too great ingestion of substances which contain these bodies.

Symptoms. Various indefinite symptoms characterize this disease. One of the most constant is digestive disturbance which may be manifested by intestinal fermentation, constipation, etc. Headache is frequent and may be accompanied by dizziness, ringing in the ears, insomnia, numbness and tingling of the hands and feet, neuralgias, and indefinite pains in various joints and muscles of the body. Neurasthenic symptoms are common as well as irritability of temper. Dermatoses, such as eczema, psoriasis and pruritus ani, are often observed. Palpitation, cough, and loss of flesh and strength may be present. The urine usually contains less uric acid than normal, and there is frequently an excess of indican due to the digestive derangement. There may be traces of albumin and a few hyaline casts. Crystals of calcium oxalate are often seen.

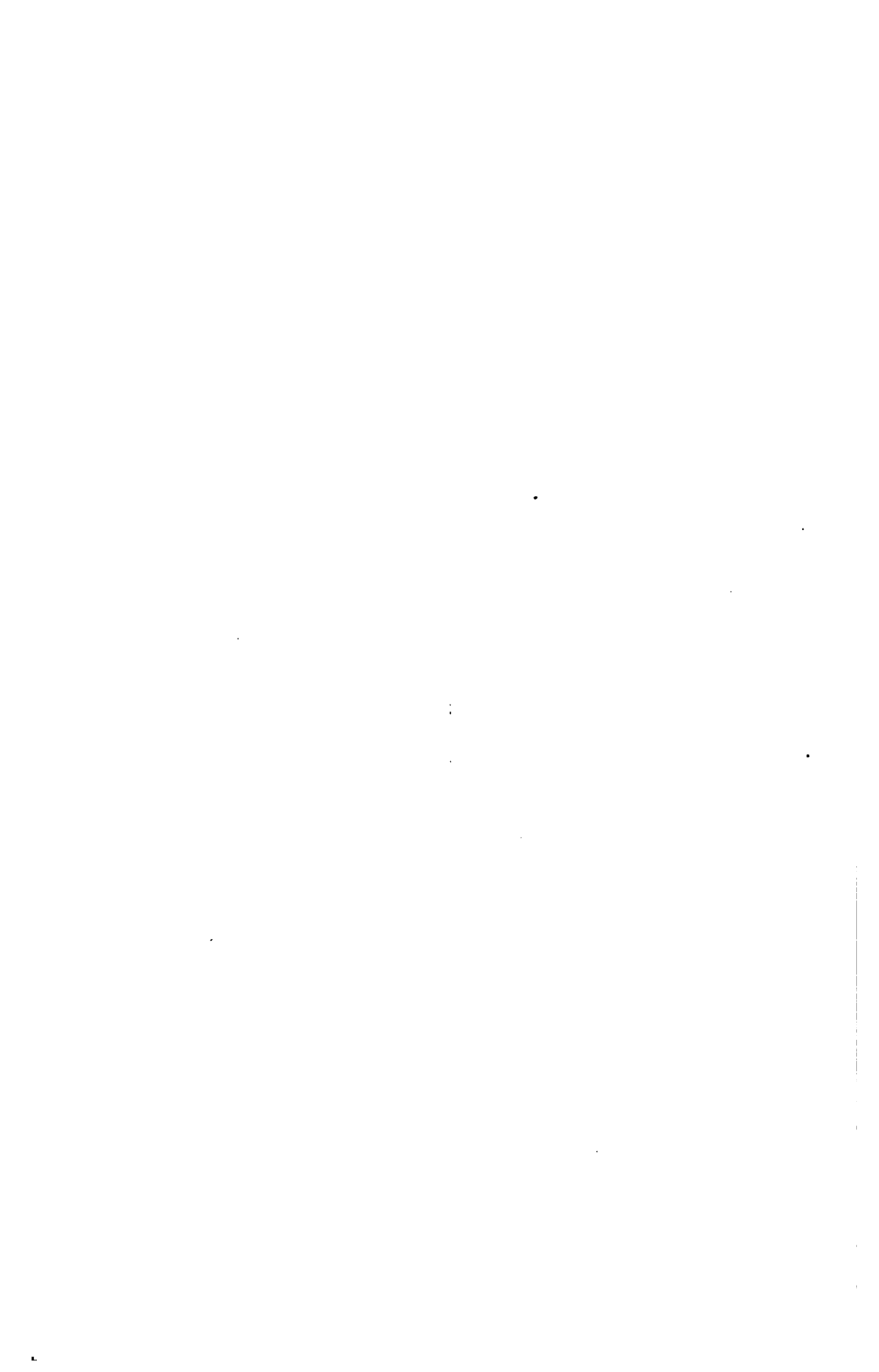
Treatment. The keynote of treatment lies in (1) limiting all toxic influences and formation of toxins, particularly in the alimentary canal, in order to minimize the retrograde metamorphosis of the body nucleins; (2) preventing the absorption of all toxic material; and (3) promoting the elimination of toxic agents. And this means thorough regulation of diet, digestion and elimination, with especial attention to be paid to the bowels.

Diet. The diet should consist of purin-free foods in so far as possible; these are, milk, eggs, butter, cheese, white bread, rice, sago, and fruits. Those containing under two-hundredths of one percent. of purin nitrogen are beer, stout, onions, asparagus, brown bread. Under three-hundredths of one percent. oatmeal, lentils, beans, peas. Under five-hundredths of one percent. salmon, cod, pike, halibut, mutton, veal, pork, ham, turkey, chicken. Under one percent. liver, steaks, soups. Under four percent. sweetbreads. Obviously were the attempt made to regulate the diet according to the amount of purin nitrogen found in food. various articles would be permitted which would prove detrimental; also the patient must not be disregarded, for the metabolic reactions in this gouty condition are incontestably abnormal. Hence it is clear that any attempt to regulate the output of uric acid formed in the body by altering the intake of purin-containing substances must be futile when we consider that there are factors influencing metabolism in our patients which are important. Finally the clinical observation that the appearance of an excess of uric acid and urates in the urine is generally coincident with the diminution or disappearance of the symptoms leads to the conclusion that the elimination of bodies antecedent to uric acid by agents which increase the uric acid output as uric acid is also not to be forgotten.

In considering endogenous uric acid, unquestionably methods whereby the toxæmia, which results in nuclear destruction, is obviated should be mentioned. Metabolism, in character at least, is profoundly altered by the

ingestion of various substances such as lead. Waters containing lime and iron are well known to be harmful. Indirect poisons are also potent as well as direct. The effect of alcohol in purinæmic subjects is not wholly due to the alcohol *per se*, but more probably to some of the more readily fermentable carbohydrates, as the ethers, esters or acetone groups which are found in the sweeter or more fruity wines used by the rich, or accessory products found in the malted beverages drunk by those in moderate circumstances. The logical inference is that substances capable of producing intestinal putrefaction, and consequent auto-intoxication, should be prohibited.

If the endogenous uric acid is restrained as to its amount by preventing unnecessary waste from auto-intoxication, exogenous uric acid can be readily controlled. Evidently a prohibition of red meat, as has been the custom, should diminish the excretion of exogenous uric acid, but we are confronted by the fact that the ingestion of nitrogen is essential to the existence of the organism and so far we cannot make use of that contained in the atmosphere. The distinction between animal and vegetable foods is more apparent than real, for the glutens (vegetable albumins) at least, are oxidized and assimilated with more difficulty than animal albumins, and the excess of carbohydrates leads to intestinal fermentation and putrefaction. Clinically the prohibition of red meat has not been a success, and modern research tells us why this is so. To make a positive statement, it can be safely said that animal food in moderation is advisable. Pickled, salted, and fried meats are forbidden. Fish is excellent, even oysters and lobsters are permissible if fresh. All vegetables and raw fruit, if apart from meats, are allowable. Tea, coffee and cocoa in moderation are permitted. Alcohol in excess and inferior wines are injurious. Malt beverages should be supplanted by cider, in quantity not exceeding a pint (250.0) each day. As has been pointed out, the quantity, rather than the variety of the food, is to be limited. All rich, highly-seasoned, greasy and twice-cooked foods, strong soups, cooked tomatoes, rhubarb, sweet cooked foods are to be avoided. Large mixed meals of animal and farinaceous foods with fruit and wine, especially if the latter be sweet or fruity, provoke the disease. Plainly cooked animal food, preferably roasted or grilled, and limited to the quantity necessary for nutrition, is eminently satisfactory. Two ounces (60.0) per day of good whiskey if such can anywhere be found, well diluted, will satisfy those habituated to alcohol. Excess of water should be taken only apart from meals. Sedentary habits interfere with digestion and assimilation and lead to the ingestion of more food than the muscles and liver can burn up. Consequently an out-of-door life, with such exercise as moderate bicycling, golf, and the like, is to be recommended. The body weight should be kept as near the normal as possible by means of physical exercise. In fact, excessive food, improper forms and amounts of alcohol, and lack of exercise are factors which lead to gout and the purinæmic conditions which are earned rather than inherited. The last thera-



peutic fact which calls for comment is the method by which an excess of uric acid, and especially its forbears, is removed from the tissues. The alkalies and salicylates are our chief reliance in that they not only make these products more soluble, but also because they favor their elimination. The prolonged use of alkalies is obviously disadvantageous so that we must rely chiefly upon the salicylates. One of the most excellent and useful of the forms of these salts is saligenin tannate, a substance obtained from several species of *Salix* and *Populus* (nat. ord. *Salicaceæ*). It is a decomposition product of the glucoside salicin, saligenin in chemical combination with castaneotannic acid. Over salicylic acid it presents the advantage that, while equally efficacious, it does not disorder the digestion nor cause untoward symptoms. It is preferable to the salicylates in that it is antiseptic, while the latter are not, and it easily splits up. Over both it offers the advantage of larger dose and longer period of administration. The dose is fifteen grains (1.0) in powder twice or three times daily after meals. The bowels should be kept open by means of sodium phosphate, cascara, podophyllin etc., as in all conditions where free elimination is necessary.

Piperazine water in well established purinæmia will be found useful in certain patients, but the administration of lithium in tablet form or otherwise is likely to yield little or no result; on the other hand the persistent use of waters containing lithium salts, especially during the spring of the year, is useful as a preventive measure. The bitter tonics, such as nux vomica, gentian or cinchona, are often useful. The headaches and other pains may be controlled by antipyrine salicylate (salipyrine) in ten grain (0.65) doses and repeated. Morphine should be used only as a last resort.

For certain patients a sea voyage or change of climate will prove of benefit. The treatment of these patients at various foreign spas is sometimes of benefit in that their business, pleasures and habits are interrupted and their only serious occupation is to get well. This benefit is extrinsic to whatever may be the character of the water or the mode of its application. All these places fail of obtaining their best results because their treatment often degenerates into a mechanical routine without consideration of the individual patient. Further, most spa methods are better adapted to the obese and sluggish than to the spare and neurotic individuals who comprise the majority of our purinæmics.

DIABETES MELLITUS.

Synonyms. Glycosuria; Melituria.

Definition. Diabetes mellitus is a chronic disease characterized by an excessive secretion of urine, which contains glucose and which is the result of a disordered metabolism.

Ætiology. The disease is more common in males than in females, and

is most frequently seen between the ages of thirty and sixty, although it may occur in childhood and even in infancy. Certain races, notably the Hebrew, possibly because this is an essentially dyspeptic people, are more prone to the disease than others. Heredity seems to influence its occurrence and, while the disease is seen more often in the well-to-do, it has also been observed in those of poor circumstances. Nervous shock, great mental strain, and sedentary habits predispose to the disease. It may occur in pregnancy. Diabetes, is a rare condition but seems to be becoming more common. Its definite causation is very obscure but it is in essence a disease of incomplete oxidation and is nearly related to gout and purinæmia. The fact has been observed that diabetics often alternate between the excessive elimination of uric acid and of sugar.

Pathogenesis. Notwithstanding the immense amount of research done in connection with diabetes, the pathology of the disease remains exceedingly obscure; however, we may consider as recognizable three classes of the morbid condition; (a) The pancreatic form. (b) The alimentary form. (c) The nervous form.

Disease of the pancreas has for a number of years been known to be a factor in the production of glycosuria. Opie has demonstrated that particular elements in the pancreas, namely, the islands of Langerhans, must be affected to produce this symptom. The most frequent pathological change in these elements which results in the appearance of sugar in the urine is a sclerosis or degeneration of other forms, hyaline for instance. The glycosuria appearing in instances of cysts of the pancreas, cancer, etc., is probably the result of a temporary involvement of these so-called islands. Also the frequent association of arteriosclerosis and diabetes renders it probable that this condition, by its interference with the nutrition of the pancreas, may result in changes which lead to diabetes.

Alimentary diabetes is brought about by some disorder of the digestive system producing an interference with proper carbohydrate metabolism, which results in an hyperglycæmia, which is due to the presence in the organism of an amount of glucose with which the body is unable to cope. For instance, in certain infectious diseases, exophthalmic goitre, alcoholism and lesions of the liver, the presence of an amount of sugar, of which the normal organism might easily dispose, in these conditions may result in glycosuria, due possibly, as pertinently suggested by Pearce, to a temporary interference with the function of the pancreas due to circulatory or toxic disturbances in the islands of Langerhans.

The nervous type of diabetes occurs in various diseases of the central nervous system; tumors, and other lesions of the floor of the fourth ventricle; traumatic and other neuroses, acromegaly, etc.

Two forms of diabetes are clinically important. The diabetes of the young is extraordinarily fatal, calls for careful differentiation and judicious

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management. When, as more frequently in younger subjects, the nitrogenous form is encountered, albuminuria alternating with or concomitant with glycosuria, the difficulties of diet are practically insurmountable.

The diabetes of pregnancy is far more frequent than is popularly supposed. Lactosuria (urine not fermentable) is common in the last months of pregnancy. Here diabetes is dangerous both to the mother because of the usual large size of child and to the foetus for the same reason, in addition to the danger of the disease. The foetal mortality may be as high as forty percent.

Unfortunately the facts known to us concerning this disease are few, but a summing up of our knowledge would seem to show, according to Edsall, that in the pancreas resides an important influence over carbohydrate metabolism. How this organ acts is not known, but it is not merely through the production of a glycolytic ferment. The investigations of Herter show that adrenalin and other reducing substances applied to the pancreas cause glycosuria. It is probable that the suprarenals may originate a secretion which, stimulating the pancreas, may increase the conversion of the hepatic glycogen. Or it may be that the disturbed metabolism of glycosuria may be dependent upon the oxidation powers of the pancreatic cells. Various fungi have been found in the blood and secretions of diabetics but their relation to the disease has not been determined. It is apparent, however, that carbohydrate metabolism is associated not only with the pancreas but with other organs, notably the liver, as well, and that the more deeply the subject is studied the more complex does it become.

Pathology. The only definite pathology, so far as is at present known, is shown as a sclerosis or degeneration of the islands of Langerhans in the pancreas. Also this organ may be atrophied, the seat of an interstitial inflammation, of malignant growths, or cystic.

The liver is often congested, cirrhotic, or the seat of fatty or amyloid degeneration.

The stomach is often dilated and marked catarrhal changes may be found, perhaps due to excessive amount of ingested food.

The kidneys, while they primarily have no influence over the disease, are frequently found in a state of hyperæmia, catarrhal inflammation, or, more rarely, may be in a state of interstitial inflammation.

The lungs may present advanced tuberculous changes or may be the seat of a pneumonia. Fatty emboli are sometimes found.

The heart is often affected with an interstitial myocarditis, fibrous or fatty.

The brain may be congested or œdematous, the seat of small hæmorrhages or softened. Tumors of the pons, the medulla, or the cerebellum have been observed. Changes have been observed in the posterior columns of the cord. What has been called diabetic tabes may be really a peripheral neuritis.

The skin is rarely the seat of pigmentation, the so-called bronzed diabetes (*see p. 480*).

Symptoms. Often the first symptom noticed by the patient is an excessive passage of urine, the characteristic urine of a diabetic being light in color, sweetish in odor and taste, and of high specific gravity. It contains glucose in varying quantity and perhaps albumin. The urea and uric acid are often increased. Cramps in the legs may be observed (Unschald's sign).

Excessive thirst, due to the increased elimination of fluids through the kidneys, and an abnormally large appetite are frequent symptoms.

Itching of the skin, especially about the vulva in women, and the prepuce in men, where this symptom is due to the irritation of frequent urination, is common and likely to result in eczema. The hair and nails are very rarely lost.

The breath may have a sweetish odor and symptoms of indigestion are common; vomiting may occur. The bowels are usually constipated, but diarrhœa may be present.

There is often emaciation and the patient complains of bodily weakness.

The lungs frequently are the seat of a chronic bronchitis and complicating pulmonary tuberculosis is common, due to the fact that the powers of resistance of the organism to the tubercle bacillus are lessened by the disease and the restriction of the diet, rather than to any direct influence of the diabetes itself.

Outbreaks of boils and carbuncles are not rare; the former may occur early in the disease, but the latter seldom appear until the later stages. It should be remembered that during the course of a carbuncle in a non-diabetic patient glycosuria may be temporarily present.

Diabetic gangrene is a symptom not infrequently met. It begins in the extremities, usually the toes, and while it may appear spontaneously from chronic proliferative endarteritis, is usually the result of traumatism, often one of very slight character. The gangrene is usually of the dry or senile type, though moist gangrene has been observed.

Coma is a serious symptom; usually it appears in the later stages and often results in death. Its onset may be sudden or gradual. If the latter, the prodromata are dizziness and irritability, the patient's condition becomes more and more stuporous and finally ends in profound coma. Convulsions and delirium are rare. While many theories have been advanced as to the causation of the coma the most probable one is that it is due to an acid intoxication, the result of the continued presence of beta-oxybutyric acid in the organism.

The blood contains glucose and the red cells and hæmoglobin are likely to be diminished.

Other body fluids, such as the saliva and perspiration, contain sugar and this has also been found in the transudates and exudates in diabetic patients.

Peripheral neuritis has already been described as a concomitant of diabetes.

Abnormalities of the eyes occur, such as cataract, retinal hæmorrhages, choroiditis, dilatation of the retinal vessels, retinitis, and retinal atrophy.

The urine is increased in amount, is of high specific gravity, contains glucose as well as, sometimes, other forms of sugar, as levulose and inosite, in pregnancy sometimes lactose, and at times certain products of fermentation as acetone (acetonuria) diacetic acid (diacetonuria) and beta-oxybutyric acid (oxybuturia). The urea is increased but uric acid may be greater or less than normal. The phosphates are likely to be increased, often largely so (phosphaturia). Frequently, when the glucose is diminished the urine will contain large amounts of calcium oxalate (oxaluria). Albuminuria, slight in amount, is common, and nephritis, well marked and in its various forms, is particularly frequent, especially in the later stages.

Prognosis. This varies with the type of the disease, with the age of the patient, and with the length of time which the affection has existed without proper treatment. Patients in whom the disease begins in early adult life are seldom cured. The chances of recovery for the patient inclined to stoutness and in whom the disease appears in middle life or later are much better. The form of diabetes resulting from disease of the central nervous system and that due to permanent sclerotic changes in the islands of Langerhans are hopeless as regards cure but not as regards improvement. The alimentary type of the disease is most amenable to treatment. Death directly from the disease, save by coma, rarely takes place. The mortality from terminal pulmonary tuberculosis has been much diminished by rational feeding. The cardiac and arterial complications should be treated and this cause lessened in potency. While we may consider as cured the patient who no longer excretes sugar in his urine, such a one must most carefully guard against a recurrence which is likely to take place should he be subjected to great mental strain or acquire any severe intercurrent febrile disease.

Treatment. In this the first step is to ascertain with which type of diabetes we have to deal; consequently we prescribe an absolute proteid diet in connection with the drinking of plenty of the alkaline waters for five days, for diagnostic purposes. After this period of time the patient is required to present for examination two specimens of urine, one the first passed in the morning (urine of fasting), the other the last voided before retiring at night (urine of digestion). If the sugar content is as when examined before the test diet was instituted, it is probable that we have a diabetes due to nervous lesion. Such patients are, however, to some extent amenable to dietetic and hygienic treatment. If we find a smaller amount of glucose in the morning specimen than in that passed at night the diabetes is probably of the pancreatic variety. If we find no sugar in the morning urine while the evening specimen shows a positive sugar reaction an alimentary diabetes confronts us.

In each of these three types of patients treatment may be considered as being (a) medicinal; (b) dietetic; (c) hygienic.

Medicinal Treatment. The drugs to be preferred are those which act chemically by retarding the formation of glycogen into glucose. Of these the author prefers uranium nitrate, which may be administered in doses of one-fourth of a grain (0.016) three times daily and increased gradually up to a maximum of four grains (0.25) per day.

Jambul acts in the same fashion by delaying carbohydrate conversion and thus enabling the organism to complete the process, and may be given, in powdered form, five to thirty grains (0.30 to 2.00) per day and gradually increased. As much as one ounce (30.0) may be administered during twenty-four hours. This drug is said to act well in some instances and not in others, and considerable difficulty may be experienced in selecting proper patients. Although this remedy has been in use for more than twelve centuries there is still much difficulty in procuring a reliable preparation.

Arsenic is another remedy, the action of which is the same as that of the preceding two, but which has the disadvantage that its prolonged administration is likely to produce digestive disturbances, neuritis, herpes zoster and fatty liver; it may be given as Fowler's solution, two to three drops (0.12 to 0.20) three times daily or as Clemens' solution three to five drops (0.20 to 0.30) at the same interval.

Opium has enjoyed extended use in diabetes and seems to have the power to diminish the excretion of glucose. Its great disadvantages are the probability of engendering the habit and the constipation attendant upon its continued administration. The employment of codeine obviates these difficulties and this drug may be given in doses of one-fourth to one grain (0.016 to 0.065) three times a day, gradually increased. Given in connection with uranium nitrate its good effect may be augmented.

Lithium salts act by assisting oxidation and, in combination with the salicylates, are useful in gouty patients. Martineau treated a large number of patients with great success with a combination of arsenic trioxide (arsenous acid) and lithium carbonate.

Aceto-salicylic acid (aspirin) in mild forms of diabetes has, according to Williamson, produced good effects. It should be given in acid solution—for instance in lemon juice—to prevent digestive disturbances—in doses of five grains (0.30) four to six times a day.

Calcium phosphate and carbonate have lately been employed with good results, perhaps due to the affinity of sugar for calcium.

Guaiacol carbonate, in ten grain (0.65) doses thrice daily, has given excellent results in the alimentary diabetes.

Potassium iodide has achieved results in glycosuria due to cerebral gumata and should also serve in the gouty form of the condition.

King, noting the usual presence of the yeast fungus in the blood of

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diabetics, has prepared a vaccine for therapeutic purposes, controlling the dosage by means of the opsonic index. The dose is one hundred millions of dead yeast fungi from a twelve-hour growth in fifteen minims (1.0) of a sterile salt solution, administered once or twice each week. Two years' observation of a considerable number of diabetics seems to establish the value of the method, especially in young subjects.

Antipyrine, acetphenetiding (phenacetine), and other coal tar derivatives may lessen the excretion of sugar in the nervous type of the condition because of the control which they exert over the conversion of proteid into sugar. They also may be found useful in other varieties of diabetes. They may be given in doses of ten to fifteen grains (0.65 to 1.00) three times a day in combination with sodium bicarbonate and preferably when the stomach is empty.

Potassium or sodium bromide may be given with good results in the diabetes of neurasthenics or in that of mental disturbance.

Lactic acid in doses of seventy-five to one hundred and fifty grains (5.0 to 10.0) daily, dissolved in water, has been recommended by certain Italian physicians.

Gold and sodium chloride, methylene blue, and ergot have their advocates but are of extremely limited use.

The various preparations made from the pancreas of animals, from which much was expected, have so far failed to find any permanent place in the treatment of diabetes, and the same may be said of the extract of the supra-renal body.

In concluding the discussion of drug treatment it may be said that too much medication in diabetes mellitus should not be advised. Drugs should not be given when we are able to cause the disappearance of the sugar from the urine by dietetic and hygienic treatment.

Dietetic Treatment. An exclusive diet of proteids and fats is not advisable unless absolutely necessary, for it has been proven that coma is more likely to occur in patients who are getting absolutely no carbohydrate food. When carbohydrate food is allowed a diabetic we must see to it that the organism is able to take care of it and does not excrete it as glucose. In this connection regulation of the amount of carbohydrate intake and proper exercise will do much. For instance, in an obese diabetic of the alimentary type who is accustomed to little exercise, we may at first eliminate most of the carbohydrate foods until the glycosuria has disappeared and then gradually allow a return to a mixed diet, slowly increasing the patient's physical exercise the while so that he may be able thus to convert the steadily augmenting intake of starchy food. A pedometer is an excellent instrument for determining the amount of walking which a patient can and should do. Thin patients of this type we can hardly deprive of carbohydrates, since they need a certain amount of this class of food to keep up their nutrition, otherwise this deteriorates and

the diet consisting of fats and proteids alone is almost certain to engender a cirrhosis of the liver. Consequently, the thin alimentary diabetic may be allowed starchy foods in certain quantity and we should be content if we reduce the quantity of sugar in his urine to one-half of one percent.

With regard to the articles of diet which diabetics may be allowed it may be said that such food stuffs should be selected as contain: no carbohydrate whatever; or very little carbohydrate or carbohydrate in easily assimilable form which may be converted by the organism. To the first class belong all varieties of fresh and salt meat, liver excepted, clear meat soups, poultry, fish, shell-fish, butter and eggs, fats and oils, and cheese.

As belonging to the second class may be mentioned the green vegetables, such as cabbage, cauliflower, Brussels sprouts, string beans, onions, cucumbers, tomatoes, lettuce, escarole, romaine, chicory, water-cress, spinach, dandelion, beet tops, asparagus, all nuts except chestnuts, all the acid fruits, and jellies (unsweetened) prepared from meat juices and gelatin.

Many of these substances contain a considerable quantity of sugar but not in the form of grape sugar. The various sugars and starches which they contain are more easily converted than glucose and consequently are taken care of by the organism. Fortunately milk sugar is of this class and milk may be freely given to diabetics. Other sugars which are likely to prove more rapidly convertible than glucose are levulose, the sugar of fruit, and inosite, the sugar of muscle.

With regard to bread it may be said that the toast of wheat bread twenty-four hours old is preferable to gluten or graham breads. Gluten flour may, however, be used, to make bread or biscuits for diabetics, but it is necessary to obtain a pure gluten, which is impossible in the United States. All the so-called health foods, with which the author is acquainted, for the use of diabetics, are deliberate frauds. Cakes and biscuit made of flour of the soya bean are admissible and are said to be palatable. When stale they are likely to be rancid since the flour contains an oil. Bread made from almonds or from aleuronat flour is highly recommended.

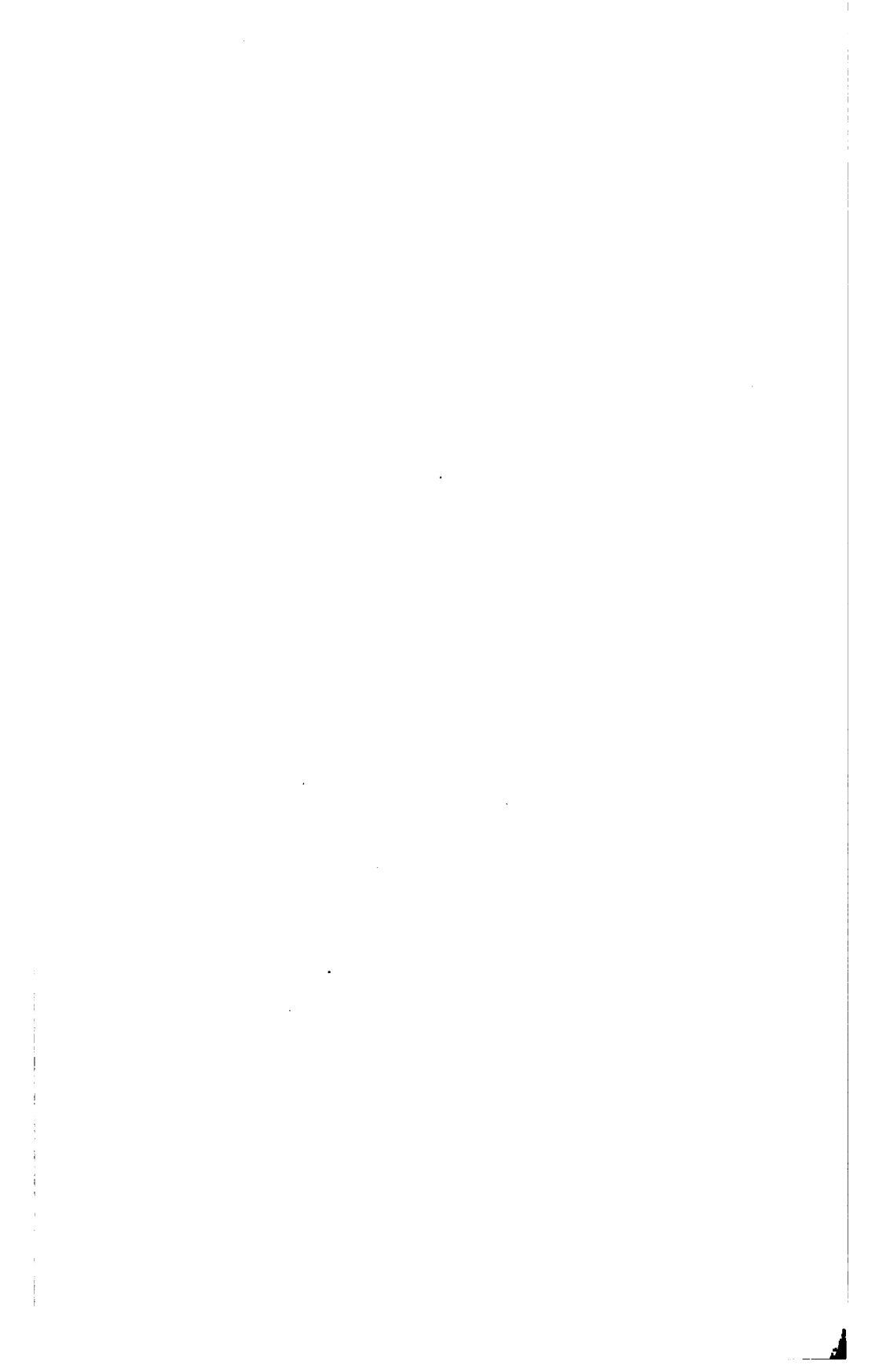
Butter may be eaten by diabetic patients but it is best to limit its quantity.

Beverages. Tea, coffee and cocoa, with cream or milk and sweetened with beet, not cane sugar, are allowable. Saccharin may also be used as a sweetening but not in greater quantity than one-eighth grain (0.008) to the cup. An excess of saccharin is likely to cause a constant, disagreeable sweetish taste in the mouth which is as unnecessary as it is objectionable. Glycerin has been employed in this connection but is inferior to the above named substances.

Malt liquors, cider, and other, fermented liquors are not permissible since they all contain sugar or carbohydrates.

Wines which contain no sugar or only a very small quantity, such as Burgundies, Bordeaux, Rhine and still Moselle wines and dry sherry, may be

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p. 463



allowed. Schreiber's dietetic wines, which contain no sugar, are largely employed.

Whiskey, gin and brandy, when unsweetened, may be given if necessary.

The drinking of considerable quantities of water between meals is to be encouraged. Patients who dislike ordinary water often will take large amounts of mineral waters when prescribed by a physician. For such it is wise to suggest a water containing as little mineral as possible, such as that of the Highland Spring.

The Potato Treatment. Some authorities believe that a diet of potatoes may be prescribed to advantage for almost all patients. One to two pounds (500. to 1000.) of this vegetable may be eaten daily with the result of diminishing the thirst and the glycosuria and of improving the general condition. If a diet containing bread is resumed the symptoms recur, only to disappear upon a return to potatoes. The reduction in the sugar is said to be due to the incomplete absorption of the carbohydrate. It is also possible that the good of the potato diet may result in part from the alkaline salts which these vegetables contain.

Oatmeal diet has been advised upon something of the same basis, with perhaps some stress being laid upon its gluten content. As a matter of observation, diabetics who can make use of the potato or oatmeal treatment with safety are few and far between.

Codliver oil may be found helpful, especially in weak and emaciated patients, and may be regarded as a food. It acts well given in connection with brandy or whiskey.

Hygienic Treatment. Exercise within proper limits is a valuable factor in the treatment of diabetes, for sugar is burned in the muscles as well as in other parts of the body. Excessive bodily fatigue must, however, be avoided, since it results in the overwhelming of the system with beta-oxybutyric acid which is likely to be followed by coma. Patients whose bodily strength is good should be instructed to walk a certain distance each day. With proper attention to the attire pedestrian exercise may be taken almost every day in the year. A moderate amount of gymnasium exercise may be taken and such games as golf and croquet are recommended. The important point with regard to exercise is to take care lest it be carried to excess. Even light exercise may be impossible for advanced and emaciated patients.

Massage is indicated in patients unable to take active exercise and in the more vigorous it may be found a useful adjunct to the other forms of treatment. It is said that under systematic massage, the quantity of urine and its sugar content may be diminished and the glucose may even be caused to disappear. Of course regulation of the diet is also necessary to produce this result.

Diabetics should clothe themselves in a hygienic manner and particular attention should be paid to the wearing of proper undergarments during the

colder months. Frequent changes may be necessary since the skin in this condition excretes certain irritating substances which if allowed to remain in contact with it may induce an eczema. Proper foot covering in wet weather is a necessity.

Decency requires the taking of at least two warm cleansing baths per week and more than these will do no harm. A cool or tepid sponge, according to the temperament of the patient, may be taken daily.

Fresh air is a necessity and the diabetic should spend much of his time out of doors and should sleep, warmly covered, if necessary, in a large, airy chamber with the window open.

The various water cures and spa treatments of diabetes are often found to be valuable but their good effects are probably due to the change of air, scene and diet, together with a regulation of the mode of life, rather than to any peculiar virtue of the waters. It should be remembered that the long journeys often necessary to reach these places have frequently caused unexpected fatalities within a few days or hours. Alkaline waters may give benefit on account of their purgative properties.

Coma. When coma is feared, either from the existence of cerebral symptoms, from a sudden diminution of the glycosuria, or when acetone, diacetic or beta-oxybutyric acids are present in the urine, large doses of sodium bicarbonate, two drachms (8.0) three or four times a day, should be given.

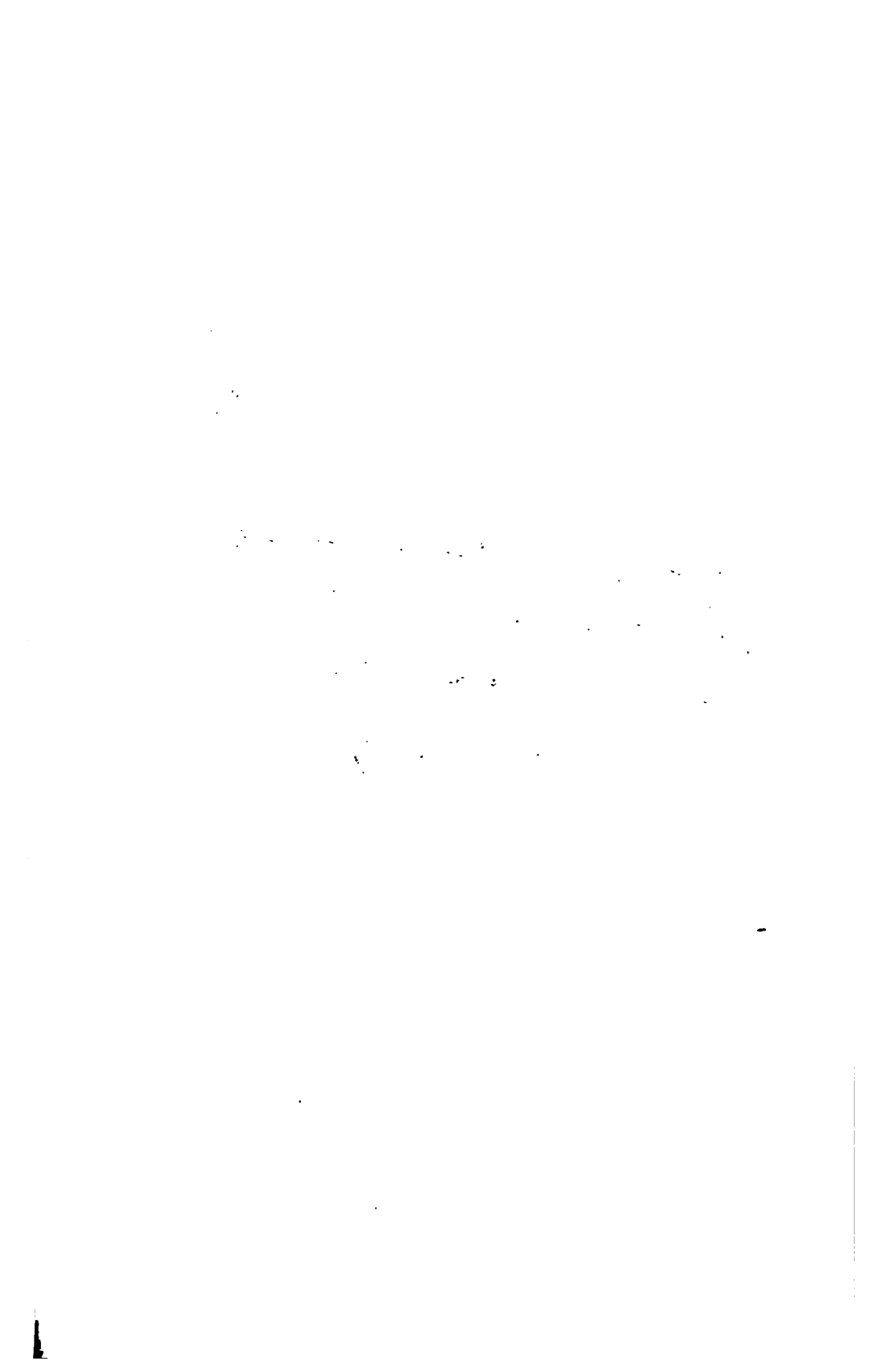
Coma itself should be treated by the infusion of two quarts (litres) of 0.9 percent. sodium chloride solution at 112° F. (44.5° C.) into the median basilic vein. If instruments are not at hand the same quantity of the solution may be given by hypodermatoclysis at 110° F. (43.3° C.) or *per rectum* at 116° to 118° F. (46.7° to 47.8° C.).

In any case the bowels should be freely evacuated in order to rid the body of toxic substances in so far as is possible, and hypodermatic stimulation should be administered as indicated. The inhalation of oxygen is often of advantage.

Surgery in diabetic patients. Surgical operations in diabetics are dangerous and often of unsuccessful outcome because of the co-existing endarteritis proliferans. However, if the disease is of mild type and the sugar can, by treatment, be caused to disappear, operations of necessity, such as, for instance, amputations, may be performed, but with a guarded prognosis.

DIABETES INSIPIDUS.

Definition. A chronic condition characterized by the passage of large amounts of urine, light in color and in weight, but otherwise normal. The affection has been considered one of the stigmata of mental degeneracy.



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Lesion of posterior lobe of
pituitary body causes
diabetes mellitus

see p. 587

Ætiology. Congenital and hereditary instances of the disease have been observed. It affects young adults most frequently, being rare after middle life; it may occur in infancy. The condition is seen more often in males than in females.

Clinically two types of the condition may be described, the *idiopathic* and the *symptomatic*. The former occurs primarily and is associated with no morbid lesion; it may be met in poorly nourished children, after the drinking of excessive amounts of cold liquids, after an alcoholic excess, as a result of fright, and in convalescent states.

The symptomatic type usually accompanies cerebral injuries and such nervous lesions as cerebral tumors and hæmorrhages, lesions of the fourth ventricle, syphilitic growths in brain and cord, etc. Diabetes insipidus may also be associated with abdominal aneurysm, tumor and tuberculosis.

The pathogenesis of this condition is best explained upon the ground that it is caused by a chronic renal congestion due to some vaso-motor disorder of the blood-vessels of the kidneys which may result from direct irritation, as in lesions of the abdomen, from central disturbance, as cerebral lesions, or from irritation of the medulla oblongata.

Pathology. There are no constant morbid changes found in this disease. Often the nerve lesions are impossible of discovery; when these are demonstrable they are usually at the base of the brain. In certain instances there have been enlargement and congestion of the kidneys and bladder; the ureters and pelves of the kidneys may be dilated and hypertrophy of the ganglia and degeneration of the cells of the solar plexus have been noted.

Symptoms. The onset of the disease is usually gradual; more rarely it appears suddenly after a debauch or an injury to the head. The most characteristic symptoms are the excretion of greatly increased quantities of clear, light colored urine of a specific gravity sometimes as low as one thousand, and an excessive thirst. Associated manifestations, which are not constantly present, are a lessened perspiration and a consequent dryness of the skin, diminished salivary secretion and dryness of the mouth. The appetite is usually not abnormally large, as a rule, but occasionally it is increased. The digestion is sometimes impaired but in most instances the general health remains good. More rarely, and particularly when the cause of the disease is an organic one, weakness and emaciation are observed. There may be pains in the back, especially at the beginning of the affection, which extend down the thighs; diarrhoea, mental weakness and disordered sexual function may be noted and a subnormal body temperature has been observed.

The urine is often passed in extraordinary quantity, a daily excretion of twenty-five to forty pints (twelve to twenty litres) being not unusual, and even much larger amounts have been observed. The color of the urine is light, this secretion at times being as clear as water, its acidity is low and its specific gravity diminished even to that of distilled water. Glucose

and albumin are seldom found and then only in traces; inosite may be occasionally found. The solids are usually not diminished in total amount, the urea may be increased to even several times its normal quantity.

Diagnosis. This is not difficult as a rule, the absence of glucose in the urine and its low specific gravity easily separating the disease from diabetes mellitus. In hysterical polyuria the condition is not permanent and there are accompanying hysterical symptoms. Chronic nephritis with greatly increased urine may be differentiated by the presence of albumin and casts, the presence of cardiac and arterial changes, and the absence of marked thirst.

Prognosis. In the idiopathic instances this is favorable as to the continuance of life and recovery is not impossible; many patients continue to suffer from thirst and increased secretion of urine for long periods without impairment of health. In the secondary type of the disease the prognosis depends upon that of the cerebral, abdominal or other causative lesion. Patients suffering from this form of the affection often rapidly become weak and emaciated.

Treatment. In the instances due to nervous or abdominal disease the treatment should be directed at these conditions; these, however, are difficult of cure unless syphilitic in nature when they often disappear under the administration of mercury and the iodides.

The distressing thirst may be relieved by allowing the patient to hold bits of ice in the mouth and the employment of acidulated drinks such as lemonade. It is probable that the patient will incur no harm by drinking sufficient water, or other innocuous fluid, to keep the thirst in check. The diet should be full and nourishing and the general health should be maintained by advising warm clothing, moderate exercise in the fresh air, warm baths or cold douches, depending upon the reaction obtained, massage, and avoidance of exposure. Baths and frictions also aid in relieving the lessened secretion of perspiration and the dryness of the skin. Counter-irritation at the nape of the neck or over the epigastrium, in subjects in whom the condition is the result of nervous or abdominal disease, is often useful, blisters or the actual cautery may be used, and, in spinal lesions especially, the galvanic current has been warmly recommended. The current should be of good strength, one pole being placed over the neck or lumbar region and the other over the epigastrium.

Numerous drugs have been employed in diabetes insipidus. Valerian has the recommendation of Trousseau, and should be given in large doses; the dose of the powdered rhizome and roots being about thirty grains (2.0) three times a day; the fluidextract, two to three drachms (8.0 to 12.0) daily in divided doses, or the tincture in drachm (4.0) doses, three times a day may be prescribed. The ammoniated tincture may be substituted if desired. Zinc valerate also may be employed, given in pill form in increasing doses until fifteen to twenty grains (1.0 to 1.30) daily are taken. Ergot is generally the



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more satisfactory remedy, in doses of one drachm (4.0) of the fluidextract three times a day and gradually increased to double that amount, is sometimes effective as is also antipyrine in daily doses of from thirty to forty-five grains (2.0 to 3.0); this latter drug should be used with caution because of its depressing influence upon the heart. Opium has been recommended but there is always the danger of habit formation to be considered. It may be prescribed either alone or with gallic acid, which latter has proved effectual in some instances; ten grains (0.65) of the acid to one-third of a grain (0.02) of the opium may be given three times a day. Sodium salicylate has its advocates and favorable results have been reported from the hypodermatic injection of strychnine nitrate one twenty-fifth to one-twelfth of a grain (0.0025 to 0.005).

Arsenic sometimes produces good results and its use in connection with the bromides is suggested. The following formula is an excellent one. Sodium or strontium bromide one ounce (30.0), Fowler's solution of potassium arsenite two drachms (8.0), iron and ammonium citrate two and one-half drachms (10.0) cinnamon water to four ounces (120.0). Of this one teaspoonful (4.0) in a wine glass (60.0) of water is to be taken after each meal.

In addition it is only necessary to state that all measures, dietetic, tonic, and hygienic, which will favorably influence the patient's general condition are valuable adjuncts in the treatment of this disease.

CHRONIC RHEUMATISM.

Definition. A chronic inflammatory process, not due to bacterial infection or trauma, affecting the softer structures of the joints.

Ætiology. This affection is most frequently seen in individuals beyond middle age who are subject to exposure and whose conditions of life are poor. In a few instances it may follow acute articular rheumatism and it has been known to precede this type of disease.

Pathology. The affected joint is enlarged and stiff as a result of the thickening of its capsule and of the neighboring tendons and their sheaths; the synovial membrane may be congested and the joint cartilages eroded; there is occasionally a slight effusion. In other instances even with marked symptoms there may be little change in the joint structures. Inflammation and subsequent degeneration of the nerves about the articulation may occur and with it muscular atrophy from disuse, as well as from trophic disorders, and, when marked effusion is present, from pressure either upon the muscles or the vessels which supply them. In the inflammations of long standing ankylosis may take place.

Symptoms. Of these the most characteristic are pain and stiffness of the joints; these are increased in cold and wet weather; motion augments the pain but lessens the stiffness; tenderness may be present with slight swelling;

redness is rare. Constitutional manifestations are not common although infrequently there may be a slight rise in temperature; in the protracted instances of the disease anæmia, digestive disturbances and neuralgia are common. As the affection progresses the stiffness becomes more marked, there is crepitation on motion and ankylosis with deformity may take place. Chronic rheumatism does not tend to cause cardiac involvement but associated fibrous changes in the valves and heart muscle are not uncommon.

Prognosis. While not dangerous to life this disease tends to progress and complete recovery is very unlikely to take place.

Treatment. Salicylic acid and its salts are of little use in this form of rheumatism although they may aid in the relief of exacerbations of the disease. The employment of drugs which benefit the patient's general condition, such as iron, strychnine, arsenic and codliver oil, is to be recommended as is the use of iodine as suggested in the section upon the treatment of arthritis deformans (*see* p. 296). In addition guaiacol, two minims (0.13) three times a day and tincture of guaiac, ten to thirty minims (0.65 to 2.0) at similar intervals are beneficial at times.

The diet need be little restricted, for it is important that the nutrition shall be maintained; fats, proteids and carbohydrates in the usual proportions, together with a moderate quantity of alcoholic beverages, if these are necessary to the patient's comfort, may be permitted.

Exercise out of doors should be continued as long as the condition of the patient's joints is sufficiently mobile as to render it possible. This is to be insisted upon and later its lack should be supplied by properly applied massage; vibratory massage is often beneficial.

For the muscular atrophy both the faradic and galvanic electric currents should be employed in connection with massage and passive motion.

Local applications are very necessary; the frequent application of cloths wet in cold water, covered with oiled silk and permanently kept about the joints, is an excellent measure. Rubbing with hot water may also afford relief to the pain. The joints should be kept permanently wrapped in flannel and this protection will have an additional counter-irritant effect if occasionally moistened with equal parts of guaiacol and olive oil; dressings of ten percent. ichthyol ointment are also effectual. The actual cautery may be employed as a counter-irritant in instances of severe pain and often the application of the high frequency electric current will afford great relief. Blistering and painting with iodine tincture have been suggested.

The hot-air treatment is frequently of much service. This consists of placing the affected joint in a specially constructed apparatus in which the temperature of the air is raised to 250° F. (121° C.) or even higher. Local exposure to radiant heat is one of the very best means at our disposal.

Hydrotherapeutic measures are very useful; those for the well-nourished subject should be different from those employed for the weak and anæmic.

Alto electric
light bath

For the former the best procedure is to give a full bath lasting from ten to fifteen minutes beginning at 95° F. (35° C) and gradually raised as high as can be borne; during the bath gentle massage should be given. Treatment at one of the alkaline or sulphur hot springs often results in great benefit probably less from any absorption of the mineral constituents of the waters than from the regular life, systematic bathing and freedom from the cares of ordinary life. Hot bathing can be carried on at home and, if persistently and intelligently employed, should accomplish quite as good results as spa treatment. After the hot bath, perspiration should be induced by a pack in hot dry blankets. This bath may be taken daily or less often as the physician considers proper and in the intervals the joints may be wrapped in cold compresses as suggested above. As amelioration takes place a hot-air bath for from ten to fifteen minutes followed by a douche bath at 100° F. (37.5 C.) reduced to 90° F. (32.5° C.) and succeeded by a Scotch douche to the joints for about a quarter of a minute, may be employed.

The anæmic patient should be given hot baths with great caution only. Two baths per week, followed by the sweats, are usually all that should be advised, and the weakening effect of the procedure will be better borne by the patient if a daily cool bath is given as follows: While standing in water at 100° F. (37.8° C.) in a room about 70° F. (22.5° C.) the patient is rapidly rubbed down with water at 80° F. (27.5° C.) which is reduced a degree or two (F.) each day. In treating the anæmic, rheumatic subject the object is to use water at as low a temperature as possible consistent with a good reaction.

Scotch douches and cold and wet compresses applied to the joints are useful adjuncts to the treatment. Hot-air baths followed by douches are also excellent.

Patients who can afford it should be advised to spend the cold and wet months in a warm climate. In summer Aix-les-Bains enjoys a high reputation. In winter patients may be sent to Salsomaggiore.

MUSCULAR RHEUMATISM.

Synonym. Myalgia.

Definition. A painful affection of the voluntary muscles, their aponeuroses and periosteal attachments, involving particularly the large muscles of the neck, back and limbs and the intercostals.

Ætiology. The condition occurs most often as a result of exposure, especially to draughts and when overheated by exercise; it is consequently more common in males. The nature of the affection is not definitely known and various theories of its origin have been advanced. It may be that it is a local expression of a general disease. It has been considered as due to a lesion of the muscles themselves, of the intermuscular septa or of

the sensory nerves of the muscles. It is an interesting fact that analogous symptoms may be caused by muscular strain. Gout, rheumatism and purinæmic conditions predispose to the condition and successive attacks are not unusual.

Symptoms. The essential symptom is pain, increased by pressure and particularly by motion. While at rest there may be a dull ache or only slight discomfort but attempts to use the involved muscles result in very sharp and cramp-like pain. Swelling may be present but there are no constitutional symptoms other than an occasional acceleration of the pulse or very slight rise in temperature. The course is often short, lasting no more than a day or two or even less; it may be protracted, however, long enough to render the term chronic not inappropriate. Recurrences are common and those predisposed to the affection frequently suffer from muscular pain and stiffness in damp weather.

Muscular rheumatism occurs in several types, the following being most frequent.

Lumbago, as its name signifies, is a painful affection of the muscles of the lumbar region. It is perhaps the most common form of muscular rheumatism and may be so severe as to incapacitate the patient, any movement of the back causing marked pain.

Stiff neck or *torticollis* affects the muscular tissues of the cervical region and renders any movement of the neck so painful that the patient holds the head in the position that affords himself the least discomfort and, when desiring to turn it, turns the body; this type of the affection is frequent in the young and is usually unilateral.

Pleurodynia results from involvement of the intercostal muscles and at times the pectorales and serrati magni. The pain here is very marked for respiration necessitates continuous movement of the chest. It is usually unilateral and affects the left side more commonly. It may be differentiated from pleurisy by physical examination and from neuralgia by the absence of tenderness along the course of the nerves.

Cephalodynia affects the muscles of the scalp, *scapulodynia* those of the scapular region, *omodynia* those about the shoulder. Involvement of the muscles of the abdomen and limbs may be observed.

Prognosis. This disease does not endanger life although it temporarily prevents exertion. It is usually provocative of bad temper and unseemly language.

Treatment. The first consideration, and one in which the patient will usually heartily co-operate, is rest. The application of straps of adhesive plaster overlapping one another like clapboards and immobilizing the affected side of the thorax is often of great relief in pleurodynia. Each strip of plaster should extend about three inches (7.5 cm.) beyond the mid-line on both back and front. The rest, especially in affections of the shoulder, should

not be too prolonged for stiffness of the joint and even ankylosis may result. Dry heat applied by means of the hot water bag or by rubbing the affected part with a hot flatiron, a layer of flannel being interposed, is often effectual in relieving the pain. Hot poultices may also be used and baths of steam may be employed. Recently hot-air apparatus has been specially constructed so that it is possible to bake any part of the body and the application of hot air by this means is an excellent method of treatment; upon the same principle a Turkish bath may cut short an attack. The application of the high frequency electric current is perhaps more effective than any of the foregoing methods and when followed by vibration massage, when this can be borne, is highly to be recommended. It is difficult to explain the action of the current but possibly it so affects the nutrition of the muscle cells, or the nerves, if muscular rheumatism is a nerve disorder, as to bring about a more normal state; certain it is, however, that many instances, particularly of chronic lumbago, may be greatly benefited by its application. The thermocautery is also useful, blisters and cups have a field of usefulness and, for very severe pain, we may have recourse to acupuncture, several heavy needles being plunged into the painful muscles and allowed to remain for two or three minutes. The hypodermatic use of morphine may become necessary.

Liniments may be employed but it is probable that the benefit derived is due quite as much to the accompanying friction as to the medicament. The best is equal parts of camphor, hydrated chloral and menthol, triturated to liquefaction and the site of application kept covered with absorbent cotton.

With regard to internal treatment it may be said that in a certain number of instances the administration of the salicylates may cause benefit, certainly a judicious trial will do no harm. For the pain antipyrine salicylate (salipyrine) in ten grain (0.65) doses given every hour for four or five doses and then at longer intervals is often effective; and empirically, good results often follow the administration of ammonium chloride, ten to twenty grains (0.65 to 1.30) every one to two hours up to the limit of the stomach's toleration; this latter drug is especially effectual in lumbago and stiff neck.

Persons subject to successive attacks should dress warmly and avoid overheating and exposure of all descriptions. Their diet should be nutritious and non-irritating and tonics, such as codliver oil, iron, arsenic and strychnine, should be prescribed if indicated and the iodides, nux vomica, sulphur or guaiac may be given in the attempt to combat the chronic myalgic tendency. Purinæmic patients should be treated in accordance with the suggestions offered under the section devoted to the management of this condition.

ARTHRITIS DEFORMANS.

Synonyms. Rheumatoid Arthritis; Osteo-arthritis.

Definition. A chronic joint disease characterized by the occurrence of changes in the intra- and peri-articular structures, by atrophy of the bony

structures or the development of osseous growths interfering with the joint function.

Ætiology. This affection is rather more common in females than in males and those whose occupations render it necessary that the hands should be much in water and thus subject to sudden and frequent changes of temperature, as well as those who are sterile or subject to uterine or ovarian disorders, appear to be predisposed to the disease. Heredity likewise has probably an ætiological significance. The incipience of arthritis deformans usually takes place during the third decade of life but exceptionally the disease may begin as early as twelve or as late as fifty years of age.

The monarticular type of the affection is probably a disease of the central nervous system and its lesions are the result of trophic changes.

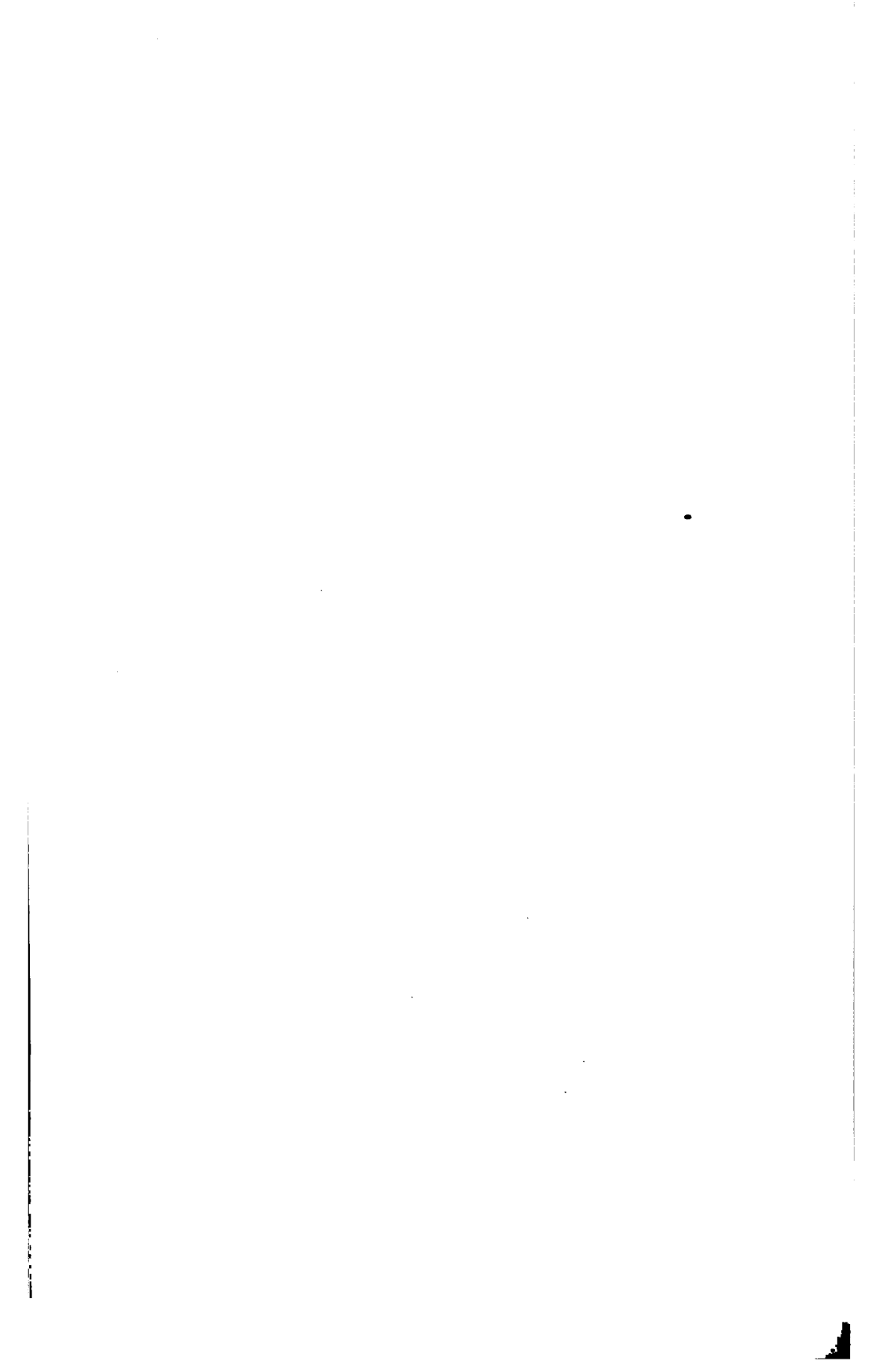
The polyarticular type has of late been attributed to infection with some as yet undiscovered micro-organism. While bacteria have been isolated from the joint lesions their specificity remains to be proven.

Pathology. There are three varieties of arthritis deformans: (a) The symmetrical type in which both upper extremities are involved. (b) The unilateral form in which the hand and foot of the same side are affected. (c) The monarticular type which involves a single joint and which is due to a lesion of the central nervous system.

The study of the joint in this disease by means of the Röntgen-ray shows that in certain instances the changes chiefly involve the intra- and peri-articular structures, the former being thickened and their fringes hypertrophied and the latter swollen and infiltrated; fluid may be present in the bursal and articular cavities. In other subjects the changes involve principally the cartilages and bones; the former soften, become thin and may become wholly absorbed, leaving the joint surfaces bare and eburnated, atrophy of the shafts of the bones may take place and nodules of bone develop at the edges of the articulations. In still a third class of patients there is bony hypertrophy; this is particularly prone to occur when the spinal column is involved and may result in ankylosis, a manifestation which is rarely met in other articulations as a consequence of this affection.

Secondary trophic changes and neuritis are not uncommon; muscular atrophy, contractures and even disintegration of the ligaments with resulting dislocation (Charcot's disease) of the joints may be observed. The extremities are deformed, the hands being often deflected to the ulnar side.

Symptoms. In the type in which the involvement is polyarticular, nodules (*Heberden's nodes*) develop gradually upon the lateral aspects of the terminal phalanges, more particularly of those of the hands; at the beginning of this manifestation signs of acute inflammation, swelling pain, redness and tenderness, may be present, and these symptoms may appear at intervals during the course of the disease without assignable cause or as a sequence of dietetic errors. These enlargements may be mistaken for gouty tophi but



are wholly different both in causation and composition. The joint cartilages soften and the articular extremities of the bones become bare and hard. Patients in whom the disease is evidenced by the development of these nodosities are likely to escape involvement of the larger joints and are believed to be likely to enjoy long life.

In polyarticular arthritis deformans of the progressive type the manifestations may be either acute or chronic. The former variety occurs especially in females in the third decade of life and in association with frequent pregnancies and lactation; it may also appear in children and at the climacteric. The attack is characterized by polyarticular swelling and tenderness and a febrile movement; the symptoms persist, it may be with remissions, until ultimately the permanent joint changes result.

The chronic variety is usually symmetrical, and gradual in onset with pain and swelling, although an acute attack may appear intercurrently. Frequently one pair of joints after another becomes involved until the patient is wholly disabled, although quite frequently the finger joints are unaffected. The articulations may become fixed in flexion, especially those of the knees and hips, the muscular contractions are common; with these there is an atrophy which renders the articular enlargements more apparent; while the joint cavity may contain fluid it is more often dry, motion being difficult and attended with crepitus. True bony ankylosis does not occur but the immobility is due to peri-articular thickening, adhesions between the articular cartilages and the presence of bony outgrowths. The presence of pain is not constant, in certain instances it may be very severe, especially at night while in other subjects the disease may develop with comparatively little discomfort. Pain on motion is the rule. Tingling and numbness of the extremities, cutaneous pigmentation and glossiness of the skin over the joints are not rare. The affection is likely to progress, accompanied by increasing weakness and anæmia, until the patient is quite disabled, although at times a stationary period may be reached and continue, the patient suffering no pain and the general health remaining good, the only inconvenience being the permanent disability. Complications are not common but coincident dyspepsia and anæmia, during the active stage of development of the disease, are frequent.

The monarticular type of arthritis deformans is observed most frequently in old men and involves especially the hip, the knee, the shoulder or the joints of the vertebræ; a history of traumatism is not rare. In the hip the condition has been termed *morbus coxæ*. There is wasting of the muscles around the affected joint and in this respect as in others the lesions are quite the same as those occurring in the polyarticular type; indeed in certain instances the other joints may not be entirely unaffected, the corresponding articulation of the opposite side frequently showing changes of minor degree.

The vertebral type is characterized by a gradual progressive vertebral

ankylosis (*spondylitis deformans*). It occurs in two types; in the one the vertebral articulations only are affected, with associated nerve symptoms, such as pain, muscular atrophy, loss of sensation and ascending degeneration of the cord; in the other the nervous manifestations are less marked and there may be accompanying affection of the hip or shoulder joints. It would seem that these two forms of this type of arthritis deformans might better be merged in one as there is little reason for their separation. The condition may begin in any part of the vertebral column and at times the affects cervical region alone. It has been thought to start as a meningitis which by exerting pressure upon the nerve roots leads to paralysis of the spinal muscles and ultimate ankylosis of the spine.

In children arthritis deformans is a very interesting condition; it appears before the second dentition with fever in acute instances but with merely joint swelling and stiffness in those of subacute type. All the joints, including those of the vertebræ, may be affected and there are often enlargements of the cervical and other lymph glands and of the spleen. Culture and inoculation experiments in this form of the disease have failed to reveal any evidence of tuberculosis.

Diagnosis. This usually offers no difficulty, although in subjects who present an onset with fever the condition may be mistaken for acute articular rheumatism, but in the latter there is a tendency to successive joint involvement. The absence of tophi will distinguish arthritis deformans from chronic gout which is frequently hereditary, generally caused by dietetic errors, more frequently involves males, and their big toes, has a certain periodicity of attack, presents changes in uric acid formation and excretion and finally is likely to have many complications. The differentiation of the disease in its late stages from chronic rheumatism is difficult, in fact the affection is considered by some as an advanced form of this latter disorder. However, the distribution of the lesions and the history of the disease will generally lead to a correct opinion.

Prognosis. As regards cure this is distinctly unfavorable but the disease in no way interferes with the continuance but much with the comfort of life.

Treatment. For the patients in whom the onset is acute and resembles that of acute articular rheumatism treatment, external and internal, similar to that of the latter disease should be prescribed. Of the chronic stage the internal treatment should be calculated to improve nutrition in every way possible and, while we may not be able to influence the course of the affection in any great measure, we can accomplish something and the patient may be encouraged with the hope that the progress of the disease may stop at any time, also with the fact that periods of remission in its development may occur. The tonics, especially iron and iodine, are indicated and the judicious administration of arsenic is to be recommended. Iron may be prescribed in the form of the sulphate or, if this causes gastric disturbance, iron vitellin in

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half-ounce doses (15.0) will prove an excellent substitute. Iodine may be given with iron in the form of syrup of iron iodide or separately as syrup of hydriodic acid of which one drachm (4.0) should be taken a half hour before each meal in a wineglass (60.0) of water. A ten percent. solution of iodine in oil of sesame may also prove beneficial; of this ten to twenty drops (0.65 to 1.30) may be given every three hours. Iodine is particularly useful when there is tendency to peri-articular thickening and it is probable that its administration in either of the forms above suggested will effect more benefit than will potassium iodide; this last, however, may be employed if desired. If used it should be employed in the way recommended by Luff, a cachet containing the requisite dose to which is added ten grains (0.65) of guaiacol carbonate, and continued thrice daily for at least a year. In the improvement of the general nutrition codliver oil is an excellent adjunct to the patient's diet which should be as generous as possible. The regimen should not be restricted except in so far as to eliminate indigestible and irritant foods. The bowels should be kept freely open.

Exercise, when practicable, should be advised and should be taken, if possible in the out-door air. Unfortunately, in many instances, the nature of the disease prevents systematic out-door exercise and it is here that massage will prove extremely useful; by its employment we successfully combat the tendency to stiffness of the joints, prevent in some measure the muscular atrophy and diminish the infiltration about the articulations.

Of other physical methods the treatment by means of the application of hot dry air—the so-called baking process—will benefit many patients and should always be tried even though in a certain number of instances it will probably be found ineffective.

Electricity in the form of the continuous constant current (galvanism) is useful in diminishing the pain and is often otherwise beneficial, and the electric bath, beginning with a rather weak current, may be employed. Static electricity properly administered is often of great benefit and indeed brilliant results have been achieved by it.

Spa treatment and the hydrotherapeutic measures that accompany it may afford some relief. Hot baths of water, air or steam are best but should be taken tentatively at first, for some patients are made worse by their employment, probably owing to their depressing influence upon nutrition, particularly when they are taken in connection with dietary restriction. It must be remembered that a full diet is one of the essentials in the treatment of this disease. Hydrotherapy at home is often practicable and hot-air baths may also be taken in the patient's own house. Hot sand or mud baths are often beneficial; the former may be conveniently taken at home. The application to the painful joints of hot wet or dry compresses is frequently effective in lessening the pain, as also may be the application of the actual cautery.

Orthopædic surgery has a field of usefulness in the treatment of this

disease, particularly in the patients with spinal involvement, the acute stage of which may be greatly benefited by means of immobilization with the plaster of Paris jacket. Recently the hip joint, when the site of this disease, has been rendered painless and markedly useful by this form of special surgery. The breaking up of the joint adhesions under anæsthesia is sometimes indicated.

OBESITY.

Synonym. Corpulence.

Definition. An abnormal accumulation of fat in the tissues of the body.

Ætiology. Obesity occurs in numerous instances as a result of hereditary influence; it usually does not appear until after middle life but is sometimes seen in children in whom it is met as a result of improper feeding. In these subjects it is often associated with rickets. While many corpulent persons enjoy excellent general health a superabundance of fat is frequently observed in chlorotic girls. Obesity by no means signifies that the sufferer is an excessive eater for it is a notable fact that many fat persons are abstemious in this regard, perhaps not so much as a result of self-denial as of lack of appetite.

Gout is an ætiological factor which is not to be neglected but the most important cause is the association of over-eating and too little muscular exercise. Women, possibly because of their greater proneness to a sedentary mode of life, seem to be more subject to obesity than men. The excessive use of alcoholic drinks, especially the malt beverages, has a direct influence in the production of this condition. The tendency of obesity to appear after the menopause and with the decline of sexual activity in the male would seem to show that sexual indulgence lessens the predisposition to its occurrence.

Fat may be derived from any one of the three classes of food and usually obese persons are those who eat largely of carbohydrates, fats and proteids, the carbohydrates, in the light of our present knowledge, being less responsible for fat production than was formerly believed.

Symptoms. These, in the corpulent subject who is otherwise in good health, consist merely of the familiar appearance, large round visage, multiple chin, great girth, etc., which one sees so frequently. As the obesity increases, dyspnœa and the symptoms due to fatty infiltration of the heart muscle and arteriosclerosis, such as weak heart action and tendency to venous congestion with œdema, appear.

Enlargement of the liver, due to fatty degeneration of the organ, is common and digestive disorders are frequent. Women often suffer from complaints peculiar to their sex, and the occurrence of intertrigo, where as a result of the excessive development of fatty tissue, two skin surfaces come into contact, as in the groins, about the labia and under the breasts, is often observed.

Frölich's syndrome (General
morbidity with sexual infant-
ilism) may be occasioned by
tumors of the pituitary or
in its neighborhood.

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fact that the system is
not self-sufficient. It
requires a constant supply
of raw materials and
energy. This is a major
drawback of the system.

Prognosis. Obesity is not incompatible with long life. Occasionally, however, fatty degeneration of important organs leads to a fatal outcome.

Treatment. Prevention is necessary in subjects who show hereditary or other tendency to become corpulent; these should be advised against over-eating and the starches and fats in the dietary should be diminished. Exercise in the fresh air should be systematically prescribed; cool baths are a necessary adjunct to the other measures if the patient's reaction is satisfactory.

Various dietetic treatments have been exploited most of which bear the names of their originators. Of these it must be said that no stated method is applicable to every instance of the disease but each patient should be managed in accordance with the existing indications. Perhaps the best known system is that of Banting which consists in the elimination from the diet of carbohydrates and fats and allowing considerable amounts of proteid food in the form of lean meat; green vegetables are also permitted. Water and alcoholic drinks are not forbidden.

Ebstein's dietary restricts the quantity of food ingested but allows fats and carbohydrates in considerable amount, sweets and potatoes, however, are forbidden.

Oertel's system insists upon a diminution of the ingested fluids, only a pint (500.0) or slightly more, of water being allowed; fat is permitted in moderate amount but not so freely as by Ebstein while the proteids and carbohydrates are less restricted than by this clinician. The fluids are restricted on the ground that they increase any circulatory difficulty which may be present.

The following table gives certain dietaries expressed approximately, compared with the generally accepted requirements of an average adult at moderate work; the solid constituents are reckoned as being free from water.

Dietary.	Proteids.	Fats.	Carbohydrates.	Caloric Value.	Fluid as Beverage.
	oz.	oz.	oz.		Pts.
Normal.....	3½ (105.0)	3 (90.0)	14 (420.0)	3,000	3-4 (1,500-2,000)
Harvey-Banting.	6 (180.0)	½ (10.0)	2½ (75.0)	1,100	2 (1,000)
Oertel.....	5½-6½ (165.0-195.0)	1-1½ (30.0-45.0)	2½-3½ (75.0-105.0)	1,200-1,600	1-1½ (500-750)
Ebstein.....	3½ (105.0)	3 (90.0)	1½ (52.0)	1,300	3 (1,500)
Von Noorden...	5½ (165.0)	1 (30.0)	3½ (105.0)	1,350	2 (1,000)

Dujardin-Beaumetz recommends the following regimen: Breakfast at seven in the morning to consist of six and one-fourth drachms (25.0) of bread; twelve and one-half drachms (50.0) of cold meat without fat and six ounces (180.0) of weak tea. Luncheon at noon consisting of twelve and one-half

drachms (50.0) of bread, the crust being preferable to the soft parts; three ounces (90.0) of meat or two eggs; three ounces (90.0) of green vegetables; a salad; three drachms (12.0) of cheese and, for dessert, cooked fruit of any desired variety. Dinner at seven in the evening. No soup; twelve and one-half drachms (50.0) of dry bread; three ounces (90.0) of meat and vegetables, salad, cheese and fruit as at luncheon. The fluids are reduced and pastry and sweets are forbidden. Starches are cut down to a minimum and the only alcohol allowed is a half a glass of a light white wine with the two principal meals. Alkaline waters are also permitted and the patient may take a small cup of black coffee after dinner. Still better than to take fluids with the meals is to omit them at these times and to drink, about two hours after eating, a glass of white wine mixed with two parts of water, or, if preferred, a large cup of weak tea without sugar. With some patients it may be more advantageous to give small quantities of proper food in the intervals of the meals lest the reduction of the diet produce weakness. The importance of institutional treatment in connection with diet regulation cannot be over-rated, for the systematic exercise, bathing, etc., that can be carried on at a hospital or sanatorium are very essential adjuncts to the successful management of patients suffering from obesity.

The oxidation of the fats of the body may be accelerated by stimulation of the skin by means of massage although in some instances this procedure is not successful in reducing flesh. Hydrotherapeutic measures are also indicated, cold fresh or sea baths being preferable for some patients while others are more satisfactorily treated if Turkish and steam baths are prescribed; the latter should be followed by douches and massage.

Obese subjects should, when possible, take regular muscular exercises such as walking, bicycling, horseback riding or gymnastics.

Too much sleep predisposes to corpulence and most patients will do well to limit their slumber to six, or at most eight hours.

It is often wise to stimulate the liver, which in many instances is sluggish in its action; this may be accomplished by prescribing Carlsbad or Kissingen salts or even sodium or magnesium sulphate.

The spa treatment, as carried on at Carlsbad, Marienbad and other like resorts, is often successful in reducing the weight of over-fat subjects and many such, after a few weeks' sojourn, will exhibit marked improvement evidenced by amelioration of the unpleasant symptoms of the obesity as well as by loss of body weight. This is probably the result of the systematic and regular mode of life combined with the use of laxative water and a reduced diet. The management of obesity by means of a few weeks' stay at a resort, while, during the rest of the year the patient regulates his habits to suit himself, is far less to be recommended than a slow and continuous method of treatment.

The administration of thyroid extract in conditions of obesity has come

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into vogue during recent years and it may bring about a loss of weight in certain instances in which, perhaps, the corpulence is the result of disordered function of the thyroid gland. The dried extract is the preparation to be preferred and its usual dose for an adult is from three to five grains (0.20 to 0.30) three times daily. It is not, however, a drug to be used excepting under the care of a physician and its effects should be watched (~~see the~~ treatment of myxoedema). Preparations of fucus vesiculosus owe their value to whatever iodine they may contain. Phytolacca is useful in this disease only as it disturbs appetite and produces purgation.

The administration of iodine with the alkaline iodides has also been suggested and these may be prescribed in the following formula. Metallic iodine one and one-half grains (0.1), potassium iodide twenty-two and one-half grains (1.5), water to one ounce (30.0); of this a teaspoonful should be taken three to four times a day. The alkaline salts of lithium, potassium and sodium may also be given thus: potassium carbonate one and one-half; lithium carbonate two; sodium bicarbonate and potassium iodide of each six; water to three hundred parts; the dose of the mixture being two to three dessertspoonsful (8.0 to 12.0) daily.

SCURVY.

Synonym. Scorbutus.

Definition. A disease characterized by anæmia, general weakness, a spongy condition of the gums and a tendency to hæmorrhages from the skin and mucous membranes.

Ætiology. Formerly scurvy was very common among sailors upon long voyages where it was impossible to arrange a dietary containing fresh vegetables and from this fact the incidence of the disease was considered to be due to the lack of these articles of food particularly, but with the better methods of preserving food and with the quicker voyages which are the rule to-day the affection has nearly disappeared. However, since it has been shown that scurvy occurs epidemically, endemically and sporadically, independently of dietetic conditions, and that it may not appear when nothing but meat is eaten for months at a time, the theory that the disease is due to a lack of vegetable elements in the food has been greatly shaken. That it may appear as a result of a diet from which vegetables are wholly or in part absent is probable unless a large number of reported instances in individuals who have subsisted for considerable periods upon such articles as meat, bread, tea and coffee have been coincidences.

Certain observers have attributed scurvy to the deficiency in the diet of the potassium salts and others to the lack of the alkaline carbonates derived from the vegetable acids.

Another theory of the causation of the disease is that it results from some

toxic substance produced by the decomposition of food. This hypothesis is supported by the fact that an affection analogous to scurvy has been induced in apes by feeding them upon slightly decayed food.

A third view of the ætiology of scorbutus is that it is an infection and due to a micro-organism which is as yet not isolated. A bacterium has been found occurring in instances of the disease which, when cultivated and inoculated into lower animals, causes symptoms and lesions resembling those of scurvy; the relation of this organism to the disease is not yet definitely proven.

As predisposing causes we may mention over-crowding under unhygienic conditions, such as obtain on ships, in army camps, asylums, etc., exposure to cold and wet, and mental and physical over-work. The principal factor is, however, the eating of improper food for a considerable period.

Pathology. The changes in the blood are not characteristic of anything more than marked anæmia; there is no increase in the number of leukocytes. The blood itself is dark and fluid. Hæmorrhages in any part of the body may be observed; into the skin, mucous membranes, muscles or other tissues; they may take place even into the joints. Bleeding into the liver, kidneys and muscles may be accompanied by degenerative changes. The spleen is enlarged and softened and there is swelling of the gums, in some instances so pronounced that the teeth fall. There is generally a brawny induration the large posterior muscles of the legs and thighs.

Symptoms. The onset is usually gradual with increasing emaciation and weakness; the skin is pale, the tissues about the eyes are swollen and bluish. Dyspnœa on exertion with palpitation may be present and the patient may complain of muscular and joint pains. The gums become soft, swollen and spongy, they bleed easily, may be ulcerated and the teeth may become loose and drop out. The breath is foul and the tongue red and swollen: rarely there may be necrosis of the jaw.

Petechial hæmorrhages are noticed, first upon the legs, later upon the upper limbs and body. As the disease progresses the hæmorrhages become larger; they are dark red, rounded, and, when directly under the skin, may cause circumscribed tumors. They are less common in the mucous membranes but may take place under the periosteum and into the serous membranes. Subperiosteal hæmorrhages, especially in the legs, may break down into sluggish sores. Bleeding results from the least traumatism: epistaxis is common but hæmaturia and bloody stools are less frequent; hæmoptysis and hæmatemesis are very seldom noted.

Ædema of the ankles is common and the urine may contain albumin. The patient suffers from weakness; mastication is painful and the appetite is poor. The bowels are usually constipated. The heart is irregular and feeble and the functional murmur of anæmia may be heard over the second left space close to the sternum. The temperature is seldom elevated. Hæmorrhagic infarcts of the lungs or spleen may occur.

Mental symptoms, such as depression and insomnia, are common; delirium is a late symptom; meningeal hæmorrhage, convulsions and paralyses have been observed, as have hemeralopia and nyctalopia.

Diagnosis. This is simple when a number of instances of the disease appear at the same time and place. The hæmorrhages and spongy condition of the gums are fairly characteristic and when these occur in connection with an improper diet and disappear when proper food is prescribed the diagnosis is assured.

Prognosis. In the early stages this is good but later the tendency to serious complications such as infarct, pleural or meningeal hæmorrhage, nephritis, pneumonia, etc., renders it less favorable.

Treatment. Prophylaxis consists in so regulating the supplies taken by ships on long voyages that there shall be a sufficient amount of fresh fruits and vegetables; this has been done by law. Free ventilation and avoidance of dampness are to be advised.

The treatment of the disease is chiefly dietetic. The juice of two or three lemons or oranges should be taken daily, in connection with a regimen containing plenty of fresh meat and green vegetables, such as lettuce, watercress, spinach, onions, cabbage, celery, etc., and will cause a rapid amelioration of all the symptoms. If the digestion is so impaired that careful feeding is necessary the fruit juices should be given together with milk, beef juice, scraped beef, gruels and other easily digestible foods until a tolerance for ordinary articles is established, when eggs, potatoes and the substances mentioned above may be gradually allowed. A sluggish digestion may be stimulated by giving the vegetable bitters, strychnine, quinine, etc., and it is often advisable to add iron in order to assist the regeneration of the blood. An excellent preparation is the elixir of strychnine, quinine and iron of the National Formulary. Necessary adjuncts to treatment are moderate exercise, bathing and regulation of the general hygiene.

The various symptoms should be treated as they occur. For the gingivitis astringent and antiseptic mouth washes should be prescribed. Swabbing the gums with two percent. tannic acid or five percent. silver nitrate solution is an excellent measure. A saturated solution of potassium chlorate is serviceable if ulcers are present and potassium permanganate one to five thousand, or Dobell's solution makes a useful mouth wash.

For the hæmorrhages surgical means should be employed when necessary, and the administration of calcium lactate or chloride in forty grain (2.60) doses once daily is a very effective measure in checking these manifestations, owing to the influence of these salts in increasing the rapidity of the coagulation of the blood. The injection of solutions of gelatin has also been suggested in hæmorrhage but is less to be depended upon than the administration of the calcium salts. The same may be said of other internal hæmostatics; these, however, may be used if desired.

- The constipation may be controlled by means of intestinal irrigations.
- The complications, cardiac, pulmonary, renal, etc., should be treated as when occurring independently.
- Ulcerations upon the limbs require surgical treatment as does separation of the epiphyses which sometimes occurs.

INFANTILE SCURVY.

Synonym. Barlow's Disease.

Definition. A disease of infants analogous to scurvy as observed in adults and often associated with rickets, which was first described by Barlow in 1883.

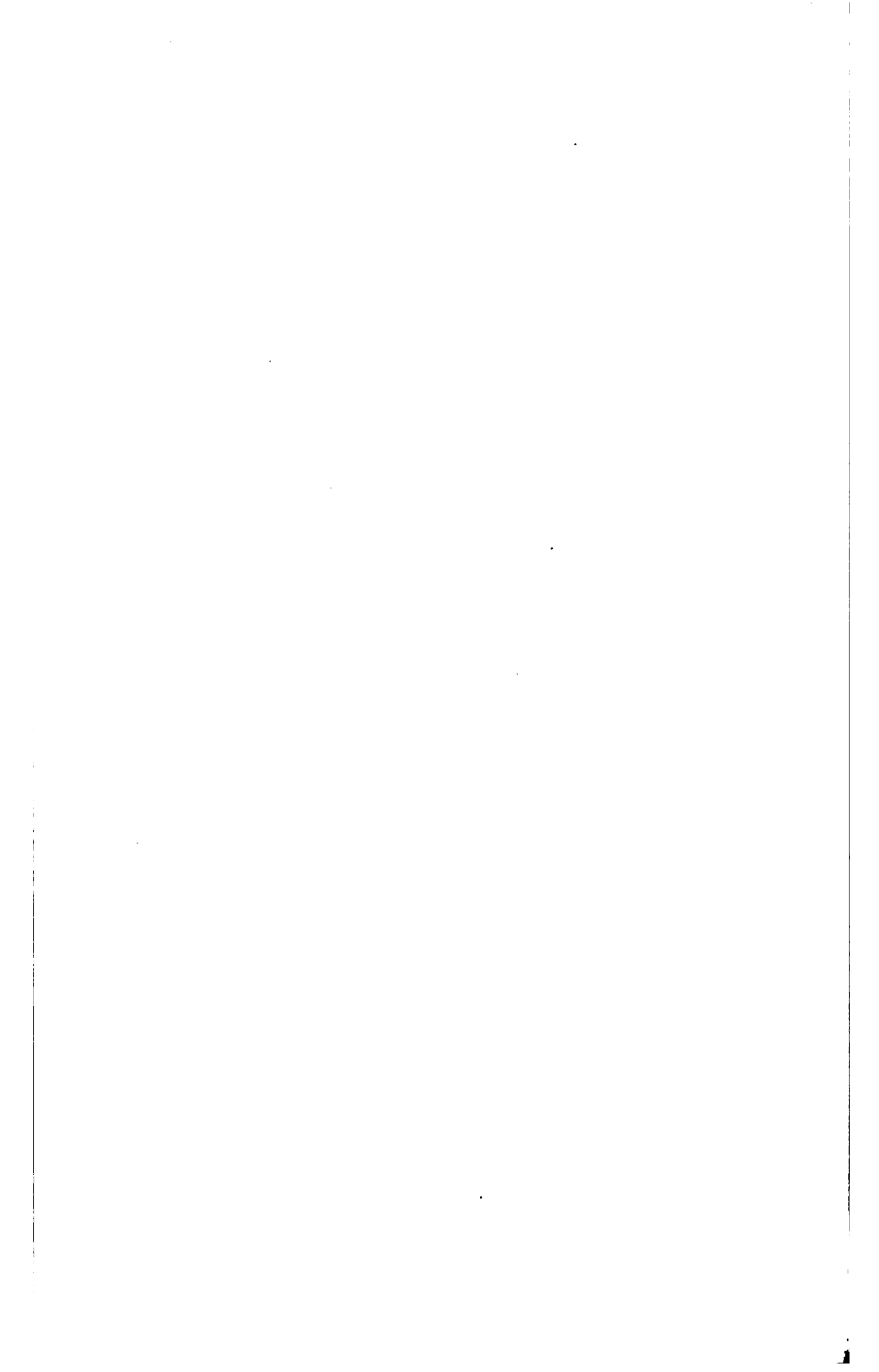
Ætiology. Infantile scorbutus is due to improper feeding; in most instances the disease occurs between the sixth and the fifteenth month and it is often seen in the best class of private practice. Exactly what the cause of the affection is, it is at present impossible to state, we merely know that it is the result of a lack of something in the food which is essential to normal nutrition. The condition is most frequently observed in infants who have been fed upon proprietary foods, sterilized, or condensed milk; it has also, but rarely, been reported in breast-fed babies. As a rule several months of improper diet, employing a preparation far removed in character from the natural food of a child, are necessary to the development of the disease.

Pathology. The most constant and characteristic lesions are hæmorrhages beneath the periosteum, especially that of the bones of the legs. Inter-muscular and peri-articular extravasations may also be present. There may be epiphyseal separations in extreme instances of the disease; changes in the bones analogous to those of rickets may be observed. Hæmorrhages into the skin, mucous membranes, the serous sacs and the viscera are sometimes found.

Symptoms. The onset is usually gradual with loss of flesh, increasing paleness and fretfulness. Soon tenderness and pain upon motion of the limbs is noticed; at first this is observed only when the child is handled, later it becomes constant; swelling above the ankles may be present; The gums, about the teeth, are swollen, spongy and tend to bleed upon irritation or even spontaneously, they are purplish in color and may obscure the teeth. Ecchymoses in the neighborhood of the large joints may appear. The increasing muscular weakness may be mistaken for paralysis. Ultimately the patient becomes anæmic, cachectic and emaciated; hæmatemesis, melæna or hæmaturia may occur and late in the disease there may be a slight febrile movement; exophthalmos due to orbital hæmorrhage may be noted. Epiphyseal separations are late symptoms and usually result from slight trauma. Albuminuria with casts is not infrequent and most scorbutic children suffer from gastric and intestinal derangement.

Diagnosis. Infantile scurvy may be differentiated from rheumatism





by the age of the patient, the condition of the gums and the history of the dietary, and from poliomyelitis by the pain and tenderness. From rickets the predominance of the lower limb affection in which there is immobility going on to pseudo-paralysis, the excessive tenderness, general swelling of the lower limbs, tense and shiny skin, which does not pit or feel hot, the thickened shafts of the bones and the liability of epiphyseal separations, the gums swollen about the teeth, either ecchymotic or spongy, make the diagnosis comparatively simple.

Prognosis. When the disease is recognized early in its course this is good, the recovery under treatment being very rapid; only very rarely are permanent lesions left behind. Unrecognized instances may terminate fatally in three to four months from cachexia, heart failure or intercurrent disease.

Treatment. The patient should be immediately put upon cow's milk properly modified in accordance with its age and digestive ability. In addition fresh fruit juice, preferably that of the orange, should be prescribed; this should be given about half an hour before feeding and in total daily quantity of one-half ounce to four ounces (15.0 to 120.0) depending upon the age and tolerance of the child. Even when diarrhoea is present the fruit juice is not always contra-indicated, this manifestation often being a symptom of the scurvy and one which becomes rapidly ameliorated under this treatment. The expressed juice of fresh beef may also be given, and, if the patient is of proper age, fresh vegetables are valuable adjuncts to treatment.

The anæmia and poor general condition often render advisable the administration of codliver oil, the syrup of iron iodide, and other tonics; these should seldom be prescribed before the scorbutic symptoms have disappeared.

Epiphyseal separation necessitates orthopædic treatment in connection with the measures above suggested. Fortunately the separations are seldom permanent.

RICKETS.

Synonym. Rhachitis.

Definition. A disease of infantile nutrition characterized chiefly by anomalies in the development of the bones and consequent deformities.

Ætiology. Rarely the affection is congenital. It occurs far more frequently in cities than in the country and is more common in Europe than in America. It is particularly frequent in the Italians and negroes of the United States, probably because the native habitat of these races offers a warmer climate than ours. It occurs especially amongst the children of the poorer classes because of the vitiated hygienic conditions in which these unfortunates are compelled to exist. In Russia it is said to appear commonly in the families of the well-to-do, the climate of this country, in its northern part at least, being such as to render free ventilation uncomfortable. Dense crowding and lack of sunlight seem to be important predisposing causes. An unsuit-

able or insufficient diet is the most essential ætiological factor and consequently the disease is more often observed in artificially fed infants than in those fed from the breast; it does, however, appear in breast-fed children when the milk is not of good quality and also when the child is not weaned at a proper time. Infants fed upon sterilized or condensed milk or upon proprietary foods are especially prone to the affection which seems here to be due to a lack of sufficient fat and proteid matter in the dietary, in consequence of which there is for some reason a defective assimilation of the calcium salts.

Syphilis may co-exist with rickets but the latter is not a manifestation of the former disease although it may be modified by it.

Sex has nothing to do with the incidence of rickets, the disease usually shows itself between the sixth and fifteenth month but the so-called late rickets may not appear until the tenth or twelfth year of life.

Pathology. The lesions are chiefly of the osseous system, particularly the bones of the cranium, the long bones and the ribs. The skull tends toward the cubical in shape (*caput quadratum*), the vault and occiput being flattened while the frontal and parietal eminences become more pronounced. The head is enlarged and the forehead bulging. The closure of the fontanelles is delayed, even until the third year, the margins of the bones being thickened and soft. Areas of delayed ossification which yield to pressure of the examining finger (*cranio-tabes*), may be present in the parietal or occipital regions.

The epiphyseal cartilages of the long bones are enlarged as a result of the rapid thickening of the zone of proliferation, which is bluish in color and soft and spongy. The periosteum is easily detachable, revealing a spongy bone markedly deficient in the lime salts. The bones bend easily, producing deformities which are particularly evident in the tibiæ as a result of the pressure of the body weight or are produced by sitting cross-legged. The femora also may be bowed outward or forward. The humerus is often bent and the radius and ulna may be twisted out of shape. Exaggeration of the normal curves of the clavicle is not infrequent.

The chest is characteristically deformed; a vertical groove may be present between the fourth and eighth ribs upon its lateral aspects producing the "chicken breast." Accompanying this deformity the so-called Harrison's groove may be observed; this is a transverse depression extending from the xiphoid cartilage toward the axilla. The "rosary of rickets" is also frequent. This term is applied to the bead-like nodules which appear at the junctions of the ribs with their cartilages.

Spinal curvatures are common, the normal dorsal convexity and the lumbar lordosis being accentuated. Scoliosis, also, is not rare. Thickening of the scapulæ and the well-known rhachitic deformity of the pelvis are often observed, the iliac bones being distorted, the antero-posterior diameter of the true pelvis diminished, and the pubic arch narrowed.

The bony deformities are due to the tension of the muscles or to the pressure of the body weight.

Upon chemical analysis the bones in rickets are found to contain a superabundance of organic matter and a greatly diminished proportion of the lime salts.

The muscles are small and poorly developed and the abdomen is usually enlarged and prominent (Lucas's sign).

Various lesions of the viscera are common. Collapse of the lung may be present beneath the lateral grooves of the thorax; bronchitis and bronchopneumonia are frequent and mild gastric and intestinal catarrh with dilatation may be observed. Splenic enlargement (simple hyperplasia) is often noted and the liver may be increased in size. Enlargements of the lymphatic glands often occur but are merely associated lesions.

Symptoms. Many of these have been dealt with in discussing the pathology of the disease. The onset is usually gradual and as a rule appears before the fifteenth month; one of the earliest symptoms is sweating of the head, especially at night and often so profuse as to wet the pillow; the child sleeps restlessly and may exhibit a slight febrile movement and digestive disturbances such as nausea, regurgitation of food, flatulence and constipation. He is poorly nourished, dentition is delayed and the teeth when they appear are often poorly formed and decay quickly. Tetany and laryngismus stridulus are not infrequent and rickets is a very important predisposing cause of infantile convulsions, these being usually excited by some digestive disorder. Tenderness over the epiphyses may be present causing the child to cry when lifted or otherwise disturbed.

The first symptom to appear referable to the osseous system is the beading of the ribs and is a very constant manifestation. In very young infants as an early symptom soft spots may be observed over the occipital or parietal bones which crackle somewhat like parchment upon pressure. This condition may occur in congenital syphilis both with and without rickets. The other bony deformities have been described in the section devoted to pathology. The fontanelles are late in closing, often persisting until the child is two and one-half years old, the forehead is protuberant and the face relatively small and of a prematurely aged expression; the veins of the scalp are often conspicuous and the hair over the occiput is thinned owing to the friction of the pillow.

The ligaments, especially those of the large joints, are loosened and stretched, causing the weak ankles, the backward bowed knees and the abnormal mobility of other articulations which are so often seen in rickets.

The muscles are flabby and small and their consequent weakness causes walking to be delayed and interferes also with standing and sitting upright. The lack of power in the ill-developed muscles may be so marked as to render the differentiation from a true paralysis impossible except by testing the

reaction to electricity. The lack of muscular tone is also in great measure responsible for the prominent abdomen and the constipation.

Rhachitic children are usually fat but their flesh is not firm and they are anæmic; they frequently exhibit lymphatic enlargements, hypertrophied tonsils and adenoids and fall an easy prey to any acute disease, being particularly prone to all affections of the mucous membranes of the respiratory or digestive tracts. The condition of the blood is not typical; anæmia is usually present in varying degrees and the leukocytes may or may not be increased in number.

The liver and spleen are often palpable either as a result of enlargement or of the downward pressure of the thoracic deformities.

Diagnosis. This is seldom difficult. Rickets is to be differentiated from syphilis by the facts that in the former disease the bone affections are at the epiphyses rather than in the extremities or shafts, that necrosis never occurs and that the enlargements are of the bones themselves, while in syphilis they appear rather like soft swellings over the bone. In scurvy there are the typical gum lesions and the hæmorrhages, and the various paralytic conditions may be separated from rickets with extreme muscular weakness, by testing the electrical reactions and the patellar reflexes, and by studying the cerebral condition.

The spine of rickets is flexible, the curves are less acute than those of Pott's disease and disappear when the patient is laid flat. The other symptoms of rickets are present, and these, with the absence of the characteristic manifestations of tuberculous hip and congenital dislocation, render the differentiation of the former affection from the two latter conditions a simple matter.

Prognosis. This is favorable, rickets alone never resulting fatally. There is always danger that the child may fall a victim to complicating disease. The course is chronic, the symptoms often continuing for months. Their progress usually ceases at the age of about one and a half years probably because the diet by this time has become more general and the child is allowed more in the open air. Under proper treatment gradual improvement takes place. The health of the patient is not permanently impaired unless there is marked deformity of the chest, although the bowing and shortening of the legs may prevent him from reaching normal stature. In females the deformity of the pelvis may be the cause of difficult labor.

Treatment. Rickets being to a great extent a preventable disease and due to improper feeding and unhygienic surroundings, the prophylaxis consists in the avoidance of these factors in the causation of the affection. When previous children have suffered from rickets those who follow are markedly predisposed to the affection and upon this account should be the more carefully guarded.

Treatment proper consists primarily in diet regulation. Breast-fed babies

when rickety should be artificially fed with properly modified cow's milk unless a wet nurse whose milk is of normal composition is available. Older children who are able to take food other than milk should be given a diet consisting chiefly of proteids and fats, carbohydrates being excluded as far as possible; milk, cream, beef juice, eggs, red meat and fresh fruit, either raw or stewed, should make up the greater part of the regimen. Farinaceous foods, and particularly the proprietary infant foods, should be interdicted.

Hygienic treatment is at least as important as diet regulation and often more difficult to arrange. Fresh air, sunshine and out-door life are absolutely essential, consequently city children should if possible be removed to the country, or, if this is impracticable, the patient should spend as much time as possible in the parks or upon the roof where oftentimes a play-ground can be constructed. Free ventilation of living and sleeping rooms is essential and the mother may be assured that, if properly clothed and protected from draughts, the child will be in no danger if the window of the sleeping room is kept open. Flannel night drawers with feet, and warm coverings are to be advised and as a hardening measure a quick sponging with water at from 65° to 70° F. (18.5° to 21.5° C.) after the daily bath is excellent.

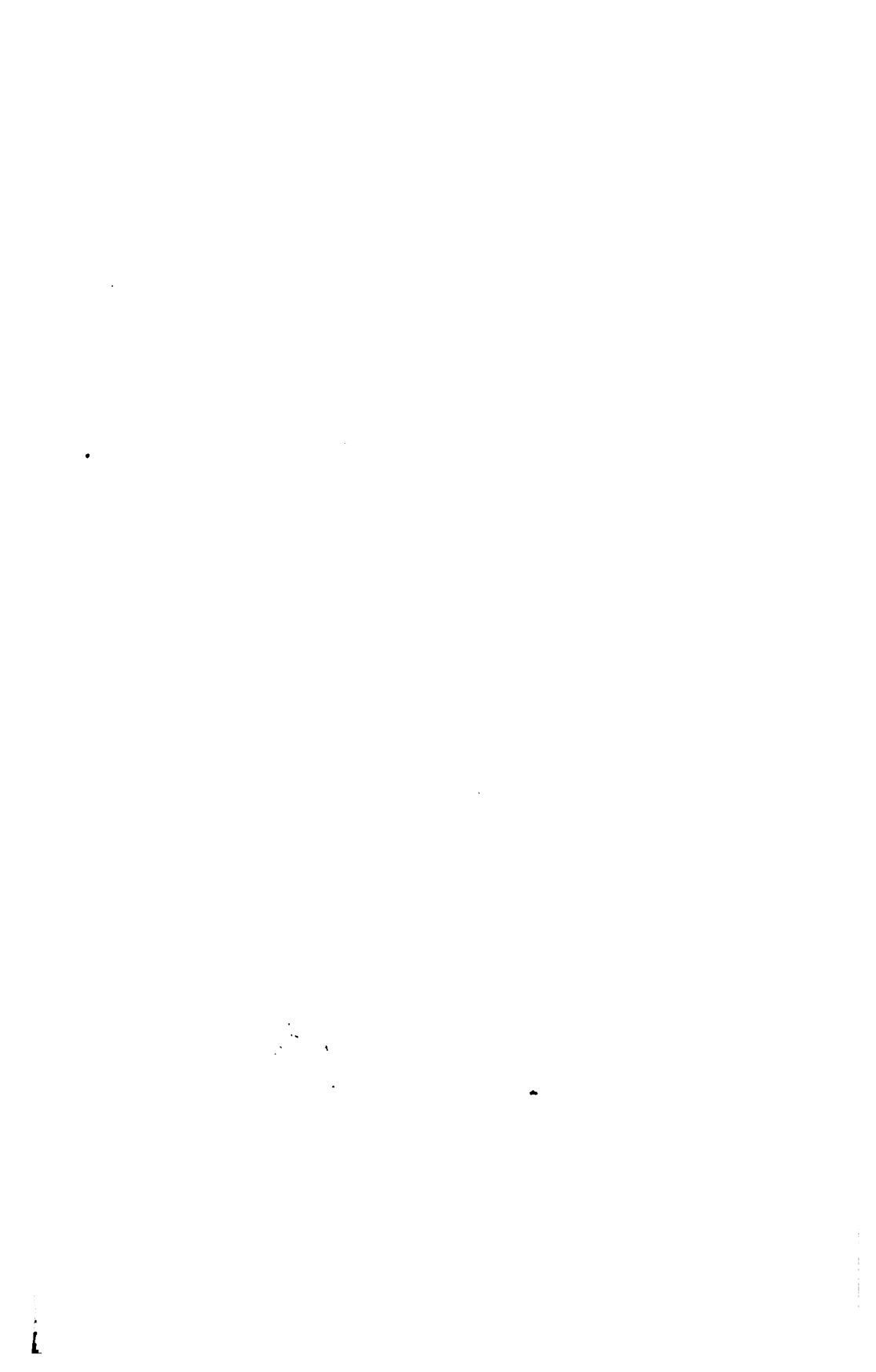
With regard to drugs it may be stated that codliver oil—which is a food as well as a drug—is our chief reliance. It may be given in doses of a drachm (4.0) or less, to half an ounce (15.0), three times a day unless it disturbs the stomach when it should be administered by inunction either pure or mixed with lanolin in the proportion of one to three or four. In very hot weather it is often wise to temporarily discontinue this agent. Phosphorus has been much used in rachitic conditions and may be given combined with olive or codliver oil in doses of one two-hundredth to one one-hundredth of a grain (0.0003 to 0.0006) three times a day after meals; larger doses may cause digestive disturbances. The following formula is a useful one: phosphorus, one-eighth of a grain (0.008), oil of sweet almond, one-half ounce (15.0), acacia, two drachms (8.0), syrup, two drachms (8.0), distilled water to four ounces (120.0). Dose, one teaspoonful three times a day after meals. Lecithin may be substituted for phosphorus, its dosage being one to two grains (0.065 to 0.13) three times a day in codliver oil. Calcium has been prescribed in the hope that it would supply the lack of mineral matter in the bones but this hope is probably vain for it is believed that any lime taken into the organism in excess of that provided by the food is excreted through the alimentary tract. Calcium, however, has a certain tonic effect in some instances and many be exhibited as the following formulas suggest. Calcium phosphate seventy-five grains (5.0), calcium carbonate two and one-half drachms (10.0), milk sugar three and three-fourths drachms (15.0), to be divided into thirty powders of which two to four may be taken daily. Or codliver oil, lime water and syrup of calcium lactophosphate equal parts; one teaspoonful three times a day.

Iron in the form of the syrup of the iodide may be prescribed in anæmic patients. Arsenic is also useful.

Upon the theory that the disease is the result of a disorder of the thymus gland the administration of the fresh calf thymus in dose of fifteen grains (1.0) for each month of the age of the patient has been suggested, or, if desired, thymus tablets may be substituted for the gland substance. Atropine in doses of one five-hundredth of a grain (0.000012) for a child of one year will lessen the tendency to sweating.

In preventing the deformities it is necessary to avoid lifting the child as much as possible and to discourage any inclination on the part of the patient to support himself in the standing position; he should not be allowed even to sit up unless supported. The deformed chest may be brought nearer into normal shape by ordering systematic respiratory exercises and gymnastics, children even as young as three years may be taught simple calisthenics, and the use of the pneumatic chamber has been suggested. The tendency to spinal curvature may be lessened by keeping the patient upon a hard bed without a pillow under the head, but, if necessary, a thin pad under the lumbar region, so that this part of the back shall be raised slightly higher than the shoulders and buttocks. Daily placing of the child in the prone position and over-correction of the deformity by lifting the buttocks, the lumbar region being held stationary meanwhile, is useful. In advanced instances orthopædic apparatus may become necessary. The curvatures of the legs may be corrected manually and, when slight, they may even be outgrown; the child should never be allowed to sit with the legs crossed beneath him or habitually in any position because of the tendency of the limbs toward deformity. Braces or other corrective treatment may become necessary. The Etappen method is preferable in most instances in that it can be commenced earlier and is more likely to be acceptable to the patients; in addition, on account of the ease and certainty of determining the amount by which the deformity is regulated excellent results are obtained. Any treatment of this sort after the age of two and one-half years may be futile on account of the firmness of the bones; osteotomy is generally necessary after this period but should usually be delayed until the child is at least four years old and the bones have become wholly hardened. Knock-knees, bowlegs and curvatures of the radius and ulna may be corrected by this operation. The flattened pelvis in women may necessitate Cæsarean section, pubiotomy or symphyseotomy during childbirth.

In the management of rickets it is necessary to remember that constitutional treatment should be undertaken as early as possible and that it is usually of little use to continue it after the beginning of the eighteenth or twentieth month, for by this time the active stage of the disease is past and merely the results of the affection remain.



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CHAPTER III.

INTOXICATIONS, INCLUDING THE EFFECTS OF EXPOSURE TO HIGH TEMPERATURES.

LEAD POISONING.

Synonyms. Plumbism; Saturnism.

Ætiology. This is a common condition and one of which the sources are numerous. The most important are: the use of soft water, carbonated waters, and alcoholic drinks, especially beer, which have passed through lead pipes or have been stored in receptacles lined with lead; the occupations of painters (*colica pictorum*), plumbers, typesetters, gold miners, white lead workers, potters, glaziers (Devonshire colic), because the laborers do not employ ordinary cleanliness and neglect to wash the hands before eating; the use of lead hair dyes and face powders, biting leaded white thread, eating certain canned fruits (lead solder), sheet lead (tin foil) about tobacco or sweets, filling holes in millstones with lead, playing with tin (lead) soldiers by children, the use of lead carbonate on burns, of diachylon plaster as an abortifacient, of lead and opium pills in dysentery, lead bullets in the flesh, the use of white or red lead in the vulcanization of rubber, of lead plates for false teeth, and the use of baking powder adulterated with lead chromate to give buns an attractive yellow color; chronic plumbism has been attributed to all these causes.

Lead is, perhaps, the best example of a poison which is comparatively harmless when taken in a single large dose, but of which most minute doses, if taken for a sufficient period, result fatally. Females are more susceptible than males; it is more frequent between the ages of thirty and forty, and during the warm season.

The lead enters the organism through the skin, respiratory tract or the alimentary system; in most instances of poisoning the toxic substance has been chiefly taken in through the mouth. Elimination takes place through the skin, kidneys, intestinal tract, saliva and milk.

Pathology. Normally a small amount of lead is present in the body and it is not very unusual for minute traces of the metal to be excreted by the urine. In plumbism lead is demonstrable in the organs and tissues. The muscles are the seat of fatty and fibrous degeneration; the nerves are in a state of degenerative neuritis; sometimes fatty changes are also present. The ganglion cells of the anterior cornua of the cord may be in a condition of

atrophy similar to that found in anterior poliomyelitis. In acute intoxication the lesions of intense entero-colitis may be found.

Symptoms. *Acute poisoning* is most frequently due to taking lead acetate, a very large amount of which is necessary to produce a fatal effect, particularly since a great part of that ingested is generally vomited. Gastro-intestinal symptoms such as salivation, thirst, dysphagia, abdominal pain, emesis and diarrhoea result and the vomitus consists of a whitish fluid containing curd-like matter; in consequence of the astringency of the lead the purging is less intense than that caused by other irritant poisons, constipation being sometimes observed. The stools may be blackish owing to the presence of lead sulphide and these and the vomitus may contain blood. These symptoms are followed by weakness, coldness of the extremities and collapse. After recovery the patient may suffer from chronic plumbism.

A subacute form of intoxication is sometimes observed in which, after a short exposure to the effects of the metal, the patient suffers from *anæmia*, acute neuritis and even epileptiform convulsions, and delirium similar to that caused by alcohol.

Chronic poisoning, it is said, may be detected by painting the skin with solution of ammonium sulphide or sodium thiosulphate; three or four coats should be applied to a patch of skin several inches square and in the presence of plumbism this area will turn dark in about twenty-four hours as a result of the formation of lead sulphide. The presence of lead is also demonstrable in the urine. In the form of the sulphide, lead is sometimes deposited upon the edge of the gums producing the characteristic "lead line," this, although commonly called a blue line, is really black in color and due to the presence of hydrogen sulphide produced by the action of bacteria (Burton's sign); if the teeth are sound and kept clean this manifestation is usually absent. The line is also observed in some instances at the junction of the anal mucous membrane with the skin.

The most prominent of the peripheral nerve effects of plumbism is *lead colic*, a phenomenon which is due to violent contraction of the intestinal muscles, probably resulting from stimulation of the nerve endings. As it is greatly relieved by the nitrites and other vaso-dilators it may be inferred that a primary vaso-constriction is one of its causes. With the colic the intestinal spasm forces the blood from the splanchnic area and the general blood pressure is raised, the pulse being slowed and rendered hard and tense. The pain, which is extreme and grinding in character, is chiefly located in the umbilical region, and the abdomen is retracted and hard; paroxysms of the most acute agony are often succeeded by intervals of comparative ease, although a dull pain over the abdomen may be constant. The colic is usually preceded by constipation and may be accompanied by vomiting. The paroxysms may last for several days or a week, and then disappear to recur at intervals. The stomach contents are usually free from hydrochloric acid.

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Other nervous symptoms apparently of peripheral origin are anæsthesia of various parts, lasting perhaps one or two weeks, and lead arthralgia, which consists of sharp lancinating or boring pain in the joints, bones, or the muscles about the joints; this latter usually appears and disappears quite suddenly. Neuralgias are sometimes observed; these may be of central origin or due to peripheral neuritis. Coarse and fine tremors, aggravated by emotion or by voluntary acts, are usually found in the hands and arms. Lead amblyopia is a rare phenomenon; the sight may be lost entirely or merely somewhat impaired. This manifestation may be due to optic neuritis, which, if allowed to continue, leads to atrophy of the nerve, to uræmia with effusion into the optic sheath or to so-called albuminuric retinitis.

In what is termed *encephalopathia saturnalis* the disorders observed are for the most part of cerebral origin, although the lower portions of the central nervous system are also involved at times. The cortex is chiefly affected and an irritation is produced which is followed by paralyses, both sensory and motor, although the latter are the more pronounced. There are usually muscular contractures and later choreic movements. Sometimes convulsions occur as a result of uræmia due to the nephritis which invariably follows chronic plumbism, sometimes they are due to the lead itself. The motor stimulation is ultimately followed by paralysis. In addition there is delirium, succeeded by depression and coma which latter may be uræmic. On the motor system the effects produced by the lead are neuritis, paralysis and atrophy. The usual site of the lesion is probably in the peripheral nerves and muscle cells, though in certain instances the central nervous system seems to be involved. A common characteristic of lead poisoning is the "drop-wrist" or "painter's palsy," which is probably attributable in part to paralysis of the extensor muscles and partly to the active contracture of the opposing flexors. Because of the prolonged flexion of the wrist there may be a backward displacement of the bones with distention of the synovial sheaths (Gruebler's sign). A characteristic of lead palsy of this type is that the supinator longus is not involved. The electrical response of the affected muscles is less than in other types of peripheral neuritis. In addition to this type, called the (a) antibrachial by Déjerine-Klumpke, the following may be described: (b) Superior or brachial, rarer than the first, and either primary or secondary to it, involving the deltoid, biceps, brachialis, supinator longus, and rarely the pectoralis. The atrophy is of the scapulo-humeral type and is usually bilateral. (c) Aran-Duchenne type, a primary manifestation, affecting the small muscles of the hand, producing a paralysis resembling the early stage of anterior poliomyelitis. (d) Peroneal type, producing foot-drop, due to paralysis of the peroneal muscles, common extensor of the toes and the extensor proprius of the great toe. (e) Laryngeal form, attacking the adductor muscles of the larynx.

The patient afflicted with chronic plumbism is always anæmic, the satur-

nine cachexia; this condition of the blood is at first due to the constriction of the peripheral vessels and later to diminution of the hæmoglobin and red corpuscles in the blood which does not usually fall below fifty percent. There is granular basophilic degeneration in many of the red cells and the presence of this condition is of some diagnostic value. Nucleated red cells are often found even if the anæmia is not of severe grade. Jaundice may result from the breaking up of red corpuscles and the liberation of large amounts of hæmoglobin. The leukocytes are often increased in number.

The results of lead intoxication upon the circulatory system consist in the production of arteriosclerosis which is early evidenced by a high tension of the pulse and an accentuation of the second aortic sound. These manifestations may be demonstrable before either colic or palsy is observed. Cardiac hypertrophy is common and the wall of the organ may be in a state of fatty or fibrous degeneration.

In the kidneys lead causes marked irritation in the process of its elimination, consequently nephritis is frequent in instances of acute poisoning and is uniformly found in chronic plumbism both as a result of this irritation and of the arteriosclerosis induced by the presence of lead in the organism.

A remarkable circumstance in connection with lead poisoning is the frequency of gout in its subjects; this coincidence is much more common in England than in America. In districts where the ordinary type of gout is rare it is said that the disease is seldom induced by lead.

Prognosis. This depends upon the degree of the intoxication; it is favorable in early instances. Atrophic paralysis is likely to prove difficult of cure and the mental symptoms of lead encephalopathy may be permanent. The arterial lesions and those of the viscera, which are evidenced by degenerative changes, are usually incurable.

Treatment. Prophylaxis is of the greatest importance and the public should be more fully instructed concerning the dangers of lead. Special precautions are required in lead works, paint factories, and in exposed trades. Dust should be avoided as much as possible, and, where this is necessarily present, thorough ventilation is an absolute essential. The necessity of frequent bathing and thorough washing before eating cannot be too strongly impressed upon the workmen. The addition to the hot baths of sodium hypochlorite obtained by the solution in two and one-half gallons of water (ten litres) of thirteen ounces (400.0) of chlorinated lime with eleven drachms (45.0) of sodium carbonate will markedly assist in cleanliness. Sulphur baths have been suggested upon the ground that the sulphur neutralizes the lead by forming insoluble compounds with it. Food should not be permitted upon the premises and the clothing, if impregnated with lead, should be changed before leaving the works. The systematic use of milk in large amounts as a food is to be recommended. Sulphuric acid lemonade is generally employed as a prophylactic but is not particularly reliable. Weak



or anæmic individuals should not be employed as workers in lead and it is advisable that women should be altogether excluded from such occupations.

In treatment the first indication is to remove the patient from the danger of further poisoning. In general, reliance is placed upon potassium iodide, saline purgatives, diuretics and the use of hot baths and massage to promote elimination, and upon the employment of appropriate measures to improve the patient's nutrition and strength. Potassium iodide is in universal use and appears to have a beneficial effect though the manner of its action is not clearly understood. It has been supposed to accelerate elimination through the kidneys, but it has recently been denied that the drug has any influence upon excretion by the urine or by the intestinal tract through which most of the lead escapes from the body. Baths of sulphurated potassium four ounces (120.0) to twenty gallons (75 litres) of water are efficient, especially if the patient is well soaped afterward and then thoroughly rinsed and rubbed with a rough towel. For the colic opium or morphine is often necessary, alum in two-grain (0.12) doses is of great service and dilute sulphuric acid is also useful. The constipation may be relieved by a combination of magnesium sulphate and dilute sulphuric acid and the lead cachexia is greatly benefited by the latter, given in connection with quinine and ferrous sulphate. In certain instances of chronic plumbism cathartics fail to act unless morphine is given to overcome the intestinal inhibition produced by the irritation resulting from the lead. Opiates may also be required for the relief of the joint pains. For the paralyses, strychnine may be administered but our chief reliance is placed upon electricity and massage, as in the treatment of multiple neuritis. If the muscles contract in response to the faradic current this should be employed, but if not the galvanic current should be used. Nephritis and gout due to lead intoxication should be treated in the same way as when resulting from other causes and the cerebral symptoms must be dealt with according to the special manifestations which present themselves.

ARSENICAL POISONING.

Acute arsenical poisoning as a result of the ingestion of Paris green, or of one of the various rat or vermin poisons which contain this substance (cupric arsenite), is common.

Symptoms. These, as well as the pathology of the condition, closely resemble those of Asiatic cholera. Large doses often cause no distress for a considerable period, but, within half a hour or perhaps longer, the patient experiences dysphagia with a sense of faucial constriction. Epigastric pain, quickly becoming extreme and general over the abdomen, follows; with it are associated nausea and excessive emesis and later there is profuse watery diarrhoea with tenesmus and thirst. The vomitus and stools may contain blood and there are muscular cramps, headache and dizziness; collapse

ensues, with coldness of the extremities, pallor, small, feeble pulse and sighing respiration. Blood and albumin may be found in the urine. Coma follows, and death, sometimes preceded by convulsions, takes place. Rarely the only symptoms noted have been collapse and coma. Death may occur within twenty-four hours but usually the patient lingers for several days. If recovery takes place the symptoms of chronic arsenic poisoning may develop.

Treatment. This consists in immediately emptying the stomach by lavage or by emetics such as zinc sulphate, twenty to thirty grains (1.30 to 2.0) or a tablespoonful of mustard to a tumbler of warm water. After the gastric contents have been removed the organ should be repeatedly washed with warm water on account of the insolubility of the arsenic. At the same time large amounts of freshly prepared ferric hydroxide with magnesium oxide or dialyzed iron, one ounce (30.0), should be given. The former mixture may be prepared by using two and one-half drachms (10.0) of magnesium oxide to which is added sufficient water to make a thin magma which is slowly poured into a solution consisting of ferric sulphate, ten drachms (40.0), and water, four ounces (120.0); the product is then shaken until a smooth mixture results. If either of these antidotes is unobtainable light magnesia mixed with water may be substituted. The antidote must be repeated at intervals as long as acute symptoms persist. If neither magnesia nor the iron preparations are available, dependence may be placed upon large doses of castor oil and water. The collapse should be combated by means of subcutaneous injections of brandy or ether and warm applications should be made to the abdomen and extremities.

Chronic Poisoning. The medicinal administration of arsenic in too large doses may induce slight toxic symptoms such as abdominal pain, anorexia, nausea, indigestion, mild diarrhoea, puffiness of the eyelids, conjunctival injection, and watering of the nose and eyes. Cutaneous eruptions are sometimes caused, and, while these may be in part a result of circulatory disorders, they are believed to be due chiefly to a direct action of the drug upon the skin. They may be erythematous, papular, vesicular or pustular and may be associated with a swelling resembling that of erysipelas. Prolonged administration of arsenic, it is said, may cause herpes zoster.

Arsenic is extensively used in the arts, especially in the manufacture of wall papers and fabrics, and consequently accidental poisoning among workers in arsenic is not rare; it may also occur in individuals who use articles containing the drug. The evidence regarding chronic poisoning from occupancy of rooms decorated with arsenical wall papers is contradictory but the facts favor its probability. Quite as often the poisoning is due to the arsenic which contaminates aniline dyes as it is to arsenical pigments, consequently chemical examinations should be depended upon rather than color. Epidemic poisoning has occurred from the use of beer in the sophistication of which glucose contaminated with arsenic has been employed.

Symptoms. In addition to the manifestations mentioned above, chronic arsenical poisoning is evidenced by a catarrhal condition of the nasal and pharyngeal mucous membranes, with sneezing and coughing; the various cutaneous eruptions appear and in some instances there is a pigmentation of the skin (arsenical melanosis); eventually the hair and nails fall. Enlargement of the liver with jaundice is sometimes observed and the later phases of the disorder are characterized by localized sensory and motor disturbances, chiefly in the hands and feet, producing the characteristic steppage gait, resulting from multiple neuritis. There are acute pain and sensations of formication in the extremities, followed by sensory paralyses with symptoms analogous to those of tabes dorsalis. These symptoms are followed by motor paralysis, as a rule confined to the limbs, but in some instances involving the trunk. The paralysis is usually symmetrical and the affected muscles, which are more often those of the extensor than flexor groups, become atrophied. Disturbed electrical reactions may suggest paralysis when apparently none exists, but which may be detected by examination of the power to extend the wrist or separate the fingers. Herpes zoster of the face or trunk is common. In very protracted instances the patient may sink into an apathetic semi-idiotic state or epilepsy may supervene. After death, in addition to the lesions in the digestive organs and nervous system, a condition of fatty degeneration of the viscera, especially the liver, kidneys, stomach and heart, as well as of the muscles, is found.

Prognosis. The chronic form of poisoning, if the source can be controlled, is only fatal by the debility which it produces.

Treatment. This consists in the discontinuance of arsenic if this is being administered, or if the condition is the result of arsenical surroundings, a removal from exposure. Elimination of the drug should be accelerated by means of laxatives, diuretics, diaphoretics, and the administration of potassium iodide. The treatment is otherwise symptomatic; the management of the paralyses will be discussed under the treatment of multiple peripheral neuritis. Tonics and plenty of nourishing and easily digestible food are indicated.

MERCURIAL POISONING.

Synonym. Mercurialism.

Acute mercury poisoning from corrosive sublimate or white precipitate is not unusual.

Symptoms. Mercury bichloride in toxic dosage at once causes a metallic taste in the mouth, extreme pain in the pharynx and stomach, rapidly followed by intense retching and emesis. The vomitus soon becomes bloody and violent purging occurs, the stools being at first serous in character, later hæmorrhagic. The urine becomes scanty and contains

albumin, casts and blood; the pulse becomes weak and rapid, the temperature falls below normal, all the vital energies are depressed and death may take place within a short time.

The *post mortem* lesions are usually those of a membranous colitis and a parenchymatous and hæmorrhagic nephritis, with general degeneration of the tubal epithelium; more rarely there is a peculiar deposit of calcium phosphate.

Treatment. The stomach should, if possible, be emptied immediately by means of the stomach tube, or, if this is not at hand, emesis should be provoked by faucial irritation, draughts of mustard and warm water, or by the hypodermatic injection of apomorphine hydrochloride in dose of one-tenth of a grain (0.006). Albumin in the form of the white of egg, that of one being sufficient antidote for four grains (0.25) of corrosive sublimate; the albuminate redissolves in an excess so that the contents of the stomach must be evacuated at once, or milk and flour should be given. Tannic acid is also useful since it protects the mucous membranes of the gastro-intestinal tract from the action of the drug.

Chronic mercury poisoning is less frequently observed than formerly when the administration of large doses of the drug was common. Workers in the metal are sometimes affected, the most profound instances of intoxication being due to the prolonged exposure to its vapors.

Symptoms. The first evidences of mercurialism are referable to the mouth. At first there is slight fætor of the breath, later an unpleasant metallic taste and tenderness of the teeth when they are forcibly brought together are noted. These are followed by stomatitis, sponginess of the gums, and salivation. If the ingestion of the mercury is continued the amount of saliva secreted becomes enormous; it is irritant and contains mercury. The breath becomes very foul, the gums are intensely inflamed, bleed at the slightest touch and are marked at the junction of the teeth by a dark-red line. The teeth are loosened and may fall, the tongue and lips become involved in an obstinate inflammation which proceeds to ulceration, and, extending as gangrene to the cheeks, may produce frightful facial deformity. Even the maxillary bones may undergo necrosis. Nervous symptoms appear, such as tremor, which is first noticed in the tongue and lips; it is usually fine, later coarse and choreiform, and gradually extends to other muscles. There is general muscular weakness and paralysis, with areas of partial anæsthesia, and joint pains may occur. The peripheral neuritis of chronic mercurialism is a much later manifestation than that of plumbism, and even after the development of the palsies the muscles retain their irritability and do not undergo atrophy. The reflexes are usually unaffected; rarely they may be exaggerated. General nutrition is impaired and metabolism is profoundly affected, anæmia and marked cachexia resulting. With the cachexia the heart becomes weakened and the respiration rapid and shallow. The cere-

bral areas are likely to be more markedly influenced than the spinal nerves. The mentality may be impaired; the memory is imperfect, the temper irritable, and melancholia, and even mania may ensue. The special senses are affected as evidenced by deafness, dimness of sight, and impairment of taste and sensation. Hallucinations may appear and the faculties may be dulled.

Children born of chronically mercurialized mothers are likely to be ailing, rachitic, or prone to develop tuberculosis.

Diagnosis. The history, peculiar tremors, paresis and mental disturbances are characteristic. Progressive general paresis, paralysis agitans, and disseminated sclerosis must be kept in mind if there is no history of mercurial poisoning.

Prognosis. If the source is removed the patient is likely to recover. Occasionally a grave mercurial encephalopathy, with a tendency to idiocy, may develop. Rarely death results from the cachexia.

Treatment. This consists in accelerating elimination of the mercury through all possible channels. Elimination through the skin is favored by baths of sulphur and ordinary hot water and diuresis should be induced by causing the patient to drink as much water as can conveniently be borne and by the administration of diuretic drugs. Free evacuation of the bowels is necessary but if marked diarrhoea is present it may call for treatment by means of opiates and other remedies. The pain may necessitate the employment of opium. The common belief that potassium and sodium iodides have an effect in causing the elimination of the metal has been disputed but never disproven; at any rate the proper administration of these drugs can do no harm; care, however, should be taken that the doses are not too large, for the combination of iodine with mercury in the tissues produces a soluble salt which is very active and may, at times, cause secondary systemic mercurial poisoning. Belladonna is sometimes required to diminish the excessive secretion of saliva and in all instances a mouth wash of potassium chlorate solution is useful in the relief of the salivation and stomatitis; tincture of myrrh may be added to it and a mouth wash of a tannic acid solution may also be employed. Careful attention should be given to the general hygiene and the cachexia should be combated by plenty of nutritious food and such tonic and other remedies as may be indicated. The treatment in other regards is symptomatic; for the neuritis the methods and means of treatment suggested in the section upon multiple peripheral neuritis should be employed. Prophylactic means such as those indicated in the prevention of plumbism should be recommended in establishments where mercury is used.

ANTIMONIAL POISONING.

Acute antimonial poisoning resembles in its symptoms acute arsenical intoxication, the chief manifestations being those of intensely acute gastro-

intestinal irritation. At necropsy the mucous membrane of the stomach and intestine is found in a state of hyperæmia and tumefaction; erosions and ecchymoses are usually present. There are often pustules in the mouth, œsophagus, stomach and small intestine, and pulmonary congestion or inflammation may be demonstrable.

Symptoms. After ingestion of a large amount of tartar emetic, metallic taste in the mouth, relaxation of skeletal muscles, severe nausea and vigorous vomiting, later purging, the later passages containing water and shreds of mucous membrane, are noted. Cramps in bowels and muscles occur. Soon collapse, clammy skin, feeble pulse and shallow respiration, subnormal temperature follow, and death closes the scene.

Treatment. The vomiting caused by the drug itself usually obviates the necessity for the employment of emetics but, if free emesis has not taken place, gastric lavage is indicated or apomorphine hydrochloride, one-tenth of a grain (0.006) hypodermatically, or zinc sulphate, thirty grains (2.0) by mouth, should be administered. The bowels should be cleared of the poison in this situation by a purge. The antimony in the stomach may be precipitated by tannic acid in doses of thirty grains (2.0); the tannate thus formed should be immediately washed out. If the acid is unobtainable a strong infusion of hot tea may be substituted. The gastric irritation may be alleviated by mucilaginous drinks and milk. The cardiac depression should be combated by means of hypodermatic injections of alcohol, ether or strychnine and hot applications to the abdomen and extremities are indicated.

Chronic antimony poisoning is of rare occurrence and difficult of diagnosis, the symptoms being of indefinite character. They consist of headache, vertigo, depression, impaired vision, nausea, vomiting, gastric disturbance with pain, diarrhoea, albuminuria, emaciation, weakness, exhaustion, and ultimate collapse. Although its use for criminal purposes is much less frequent than that of arsenic the resemblance of the symptoms to those of catarrhal gastro-enteritis renders the diagnosis of chronic antimony intoxication, when the drug is given with homicidal intent, very difficult.

After death antimony is said to be found in the liver, spleen, kidneys, bones and muscles; fatty degeneration of the viscera is also observed. The protracted administration of tartar emetic is stated to produce pustular eruptions.

Treatment. This consists in stopping the drug and in the employment of symptomatic and stimulative measures.

IODISM.

Iodism is the term applied to the train of symptoms resulting from the prolonged administration of the iodides and is induced by all these salts; the basic ion does not appear to be concerned in the effect produced. Owing



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to the fact that iodine is more readily freed from it, ammonium iodide is said to be more likely to cause iodism than the other salts.

Symptoms. These may be separated into two groups. (1) Frequently there is catarrh of the respiratory passages which commences in the nasal mucous membrane and is evidenced by a profuse watery discharge; the inflammation extends upward and downward, producing conjunctivitis and perhaps severe headache due to involvement of the frontal sinuses. Accompanying this there is faucial swelling and irritation, the tonsils may become inflamed, and laryngitis and bronchitis may result. Laryngeal oedema may occur and cause death, unless relieved. Pulmonary oedema of high degree accompanied by fever and profuse bronchorrhoea may lead an inexperienced observer to believe that he is dealing with a pneumonia. The pulse may be rapid and feeble and death may occur from respiratory paralysis. Somewhat later an eruption may appear, consisting of erythematous patches or papules which may become pustular; other eruptions have been observed. Oedema of the face is met in some instances and there may be albuminuria, casts and even a complete suppression of urine. Nervous manifestations such as neuralgia, tinnitus aurium, convulsive movements, disturbed mentality and in acute poisoning active delirium have been observed. Rarely, atrophy of the mammae and testes have been described. (2) Iodic cachexia, in which rapid emaciation takes place, is a late phenomenon and intense cardiac palpitation and ravenous appetite may develop.

Treatment. The local manifestations of iodism can sometimes be prevented by the administration of alkalies and hence it is thought that the variation of their extent in different individuals, or in the same person at different times, may be explained by a varying degree of acidity. Boiled starch is the chemical antidote. A tolerance may be established and sometimes the symptoms disappear while the drug is still being taken. Even though the manifestations may be intense they usually cease soon after treatment is discontinued and the chewing of pellitory will hasten the elimination of iodine in the chronic forms. When iodic cachexia has occurred the symptoms may not disappear for a considerable time.

BROMISM.

This term has been given to the toxic symptoms resulting from the prolonged administration of the bromides. The condition is rarely caused by hydrobromic acid although this substance contains a relatively large proportion of bromine.

Symptoms. The first of these is usually a papular, acneiform eruption appearing chiefly upon the face and back. In marked instances the papules become pustules which may coalesce, forming small abscesses which at times become ulcers. At other times the rash resembles eczema and sometimes there is an erythema or a brown pigmentation of the skin. The tongue is

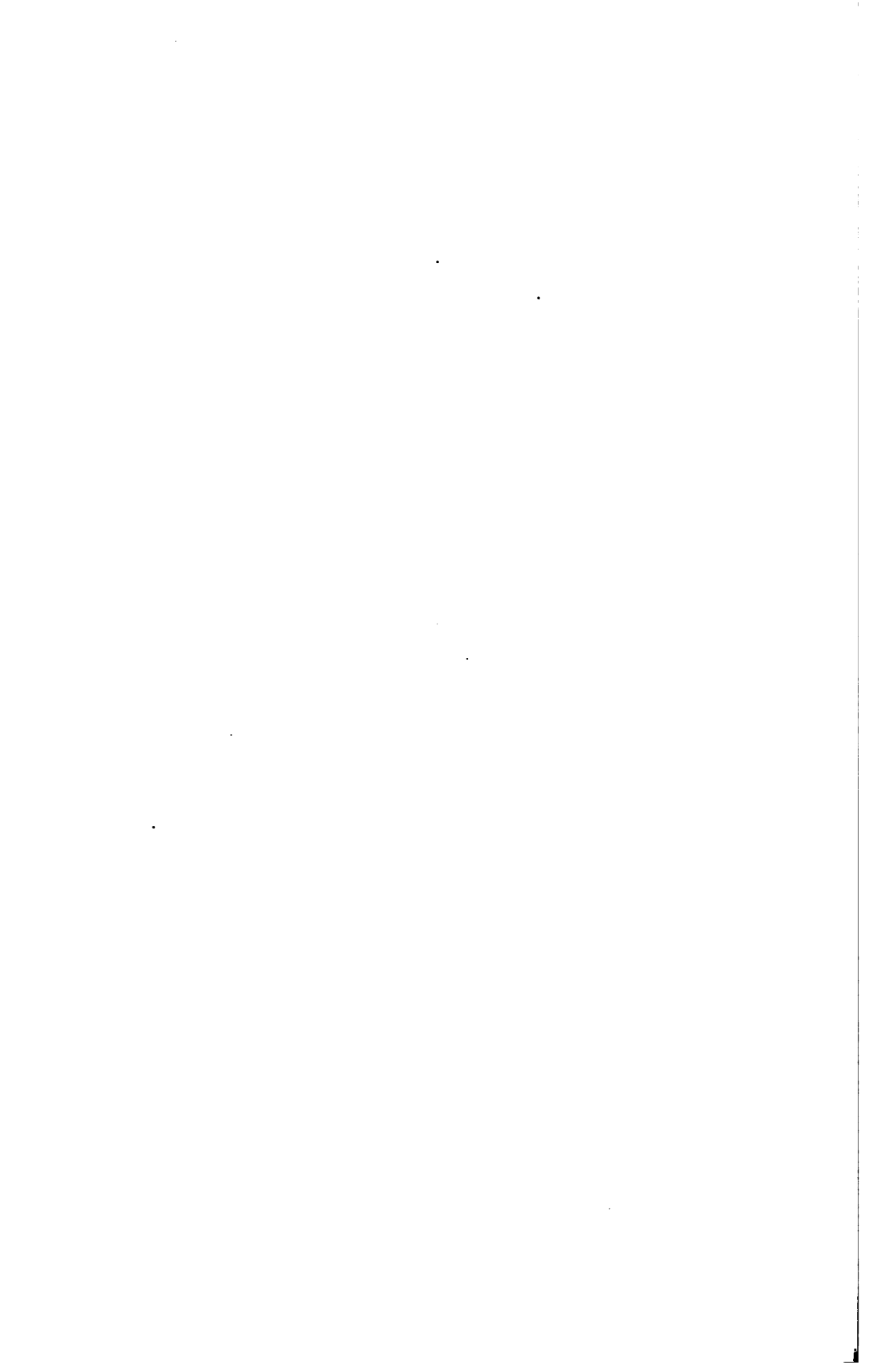
coated and there are digestive disturbances; frequently there is a coryza which may be associated with increased bronchial secretion and mild conjunctivitis. These manifestations are attributed to a local irritant action partly due to the salt action of the bromine salt and partly to decomposition of the bromide, with liberation of bromic acid and bromine by the free acids in different situations, as hydrochloric acid in the stomach, carbon dioxide in the air passages, etc. This action takes place more readily in old age and if renal insufficiency is present. From the influence of the drug on the nervous system the cutaneous sensibility and the sensitiveness of the faucial mucous membrane are distinctly reduced while the sexual desire becomes diminished. There is indisposition on the part of the patient to any exertion, he is easily fatigued, his gait is uncertain and there is often marked muscular tremor. The intellect is dulled and the memory impaired, the patient takes little interest in his surroundings, his speech is slow and he may stammer, mispronouncing words or omitting several from a spoken sentence. The facies is apathetic and stupid and the eyes are heavy and without lustre. Mental excitement, confusion and sometimes delirium may follow the continued use of moderate doses, especially of the potassium salt. The habitual user of bromides is unable to sleep without them, and a gradual increase of the dose is required to induce slumber, consequently the systemic effects are usually disastrous. In addition the patient's powers of resistance to disease are lowered and intercurrent affections, such as pneumonia or even bronchitis, may result in death. Notwithstanding the severity of the symptoms of bromism, they soon disappear after the withdrawal of the drug and its elimination from the system.

Treatment. This consists in stopping the administration of the bromides and in the employment of measures calculated to relieve the symptoms and to support the patient.

BORISM.

The continued internal use of too large amounts of boric acid or borax (sodium borate) results in a train of symptoms which has been denominated borism.

Acute Poisoning. In some instances even moderate doses of these substances have a mild aperient action while in large amounts they are gastrointestinal irritants and cause emesis and purging. Other symptoms produced by toxic quantities are dryness of the pharynx and dysphagia, intense muscular weakness, pain in the back and vesical tenesmus with albuminuria and sometimes hæmaturia, impairment of sight, headache, insomnia and nervous depression, which may be followed by fatal collapse. A rise of temperature is frequently observed, and in two or three days, if death does not supervene, scaly, papular or eczematous eruptions appear upon the skin. The symptoms are evidenced more rapidly when the drugs are taken by mouth but manifes-



tations of the same character may result from their free application in the rectum, vagina, or other parts. Boric acid and borax are rapidly absorbed from the mucous membranes and from abrasions, and serious instances of poisoning have been reported as due to the use of the acid as an antiseptic dressing.

In *chronic poisoning* the symptoms are often very similar to those of acute intoxication, the cutaneous manifestations are, however, more prominent and may constitute the only positive evidence of toxic effect, although there are usually indications of more or less gastro-intestinal and renal irritation. Edema of the face and extremities may occur as a result of the latter, and consequently it is advisable to keep a careful watch of the condition of the urine whenever these drugs are administered. The hair often becomes dry and falls, and the eruption upon the skin may resemble a seborrhœic eczema, appearing as reddish patches which desquamate like psoriasis, or papules attended with marked pruritus. The most common eruption is said to be scaly, assuming the form of a seborrhœic dermatitis, but usually associated with much more œdema. Sometimes the skin and mucous membranes are dry, the lips become fissured, the nails are striated, and a blue line similar to that of plumbism may appear upon the gums. The question of the effect of the continued and habitual introduction into the organism of boric acid or borax as employed in the preservation of food is of considerable interest. The results of careful experimentation conducted by the Bureau of Chemistry, United States Department of Agriculture, show, on the whole, that seven and one-half grains (0.5) daily is too much for a normal man to receive regularly; on the other hand a normal individual may take this quantity of boric acid or borax, expressed in terms of boric acid, for a limited period of time with but slight danger of injuring the health. The chief objection to the employment of these substances as food preservatives seems to rest upon the fraud in permitting inferior goods to be marketed as high class products. This applies especially to meats and milk although the addition of small quantities of these substances may be beneficial since it delays the souring of the latter. If larger amounts are used with fraudulent intent, the milk is apt to be kept too long, to be of poor quality, and the quantity of the preservative may be sufficient to injure infants who take the milk as a routine.

Treatment. This consists in stopping the ingestion of the adulterated food stuffs and the employment of means calculated to relieve the existing symptoms.

ALCOHOLISM.

Acute Alcoholism.

Definition. The result of the imbibition of a considerable amount of alcohol in any of its forms and within a short space of time. The quantity necessary to produce drunkenness varies greatly with the individual.

Symptoms. These are chiefly referable to the nervous system and, while the sequence of their appearance is not constant, there is usually a primary stage of excitation during which the subject's face becomes flushed, his eyes brightened and his tongue garrulous; the speech is at first coherent but soon becomes senseless; muscular co-ordination is disturbed as evidenced by the staggering gait. Locomotion soon becomes impossible and finally alcoholic coma supervenes. Other individuals are differently affected; instead of the primary excitement being evidenced by jollity and good nature it may be characterized by moroseness and the subject may be incited to violence and even murder by very slight provocation. Generally speaking, alcoholics in the acute state are either (a) still, (b) garrulous, or (c) offensive drunks. In women offensive and violent conduct is likely to be manifested or an early relapse into a maudlin condition. The stage of narcosis, however, ultimately ensues as in the previously described type of alcoholism, if sufficient liquor is taken.

Alcoholic coma is not always easy of diagnosis. The face is usually flushed but may present a cyanotic appearance; the pulse is strong and full, respiration is deep, slow, and sometimes stertorous. The temperature may be subnormal, at times even below 90° F. (32.2° C.). The urine and feces may be passed involuntarily, the pupils are dilated and muscular twitchings may be present. The individual may be temporarily aroused in most instances by pressing upon the upper margin of the orbits at the junction of their inner and middle thirds—the points of emergence of the supra-orbital nerves. There is usually an odor of alcohol upon the breath. One of the most common of the mistakes to which the inexperienced ambulance surgeon is liable is the confounding of fractures of the base of the skull for alcoholism. This mistake is rendered a particularly easy one by the frequency with which the two conditions co-exist. In fracture the coma is usually deeper, the respiration stertorous, and the pupils are often unequal. Bleeding from mouth, nose or ears is very characteristic. The difficulty of differentiation is often so great that it is always the part of wisdom to give the patient the benefit of every doubt and to consider all dubious instances of coma as proper for admission to a hospital.

Cerebral apoplexy may be separated from alcoholic coma by its deeper unconsciousness, pupillary inequality, the evidences of cardiac or vascular disease or of partial paralysis.

In *uræmic coma* the taint of alcohol upon the breath is lacking unless kind friends have been officious, the pulse is likely to be of high tension, and the patient may exhale a urinous odor. The pupils are variable; the urine when drawn by catheter shows the presence of albumin and casts.

Treatment. Recovery from the acute effects of alcohol is usual even if no treatment is administered; the event may, however, be hastened by thoroughly washing out the stomach, or, if the patient is able to swallow, by

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giving an emetic consisting of ten grains (1.30) each of powdered ipecac and zinc sulphate, or of warm mustard water—two drachms (8.0) to eight ounces (250.0). The hypodermatic administration of one-tenth of a grain (0.006) of apomorphine hydrochloride is an efficient method of relieving the stomach of its contents and at the same time bringing about a diminution of violent nervous symptoms if these are present. These latter may be usually controlled by the administration of hydrated chloral in dose of ten to twenty grains (0.65 to 1.30) with one or two drachms (4.0 to 8.0) of sodium bromide. It should be remembered that most alcoholics suffer from circulatory and renal disturbances so that hydrated chloral and other sedatives are to be used with due caution. If stimulation is necessary the patient may receive a drachm (4.0) of aromatic spirit of ammonia and if there is any tendency to collapse, frictions and hot applications should be employed. When convulsions are present, which is rarely the case, a little chloroform should be given by inhalation until the sedatives given by mouth have had time to exert their effect.

Chronic Alcoholism.

Definition. A condition resulting from the habitual and intemperate use of alcoholic beverages. What constitutes the "intemperate use" of alcohol cannot be definitely stated, for certain individuals are able to take without apparent harm quantities of this substance which would exert, in more susceptible subjects, most marked untoward effects.

Dipsomania is a form of chronic alcoholism, the tendency to which is hereditary, which is characterized by a periodic desire for alcoholic excess and is evidenced by debauches at varying intervals, the subject being wholly free from the craving during the intervening periods.

Ætiology. Impaired health, deficient will-power and self-control, lack of conscience, selfish disregard of the rights of others are predisposing causes. Drunken parents not only transmit to their children an enfeebled constitution but also furnish a depraved environment, with the result that their offspring are predisposed to intemperance. The exciting cause is the persistent misuse of alcohol. This may be either the result of social habits or, what is more important, in that it is less frequently recognized, the use of patent medicines, bitters, tonics and cure-alls, with which the market is flooded. While habitual drunkenness is gradually diminishing among men it is rapidly increasing in frequency among women owing to the severe strain of business and social life or the lack of any legitimate occupation for their leisure.

Effects of Chronic Alcoholic Poisoning. Among the common results of chronic alcoholism are chronic gastritis, gastric dilatation, especially in beer drinkers, hepatic cirrhosis, delirium tremens, and mania. Many other dis-

eases have been attributed to the effects of the chronic use of alcohol among which may be cited gout, peripheral neuritis, pachymeningitis, organic heart disease, and chronic nephritis; in fact, but few organs and tissues are not changed in some way in chronic alcoholism and its results. Of the changes met in this condition two groups are described, namely sclerosis and steatosis. While these anatomical alterations are in process of development the exterior of the body assumes characteristic appearances. The individual may be either pale or flabby but fat, with a heavy and imbecile expression or he may have a dusky red or purplish, pimply and bloated skin, with swelling under the eyes, yellow and injected conjunctivæ, and blue and thickened lips.

Alcoholics are especially likely to contract pneumonia, tuberculosis and other infectious diseases, and, when attacked by them, show less resisting power than do previously healthy persons. They are also bad subjects for surgical operations and bear anæsthesia poorly.

The *post mortem* examination of the organs and tissues of alcoholic individuals may show no characteristic changes; there is often found, however, in patients dead from *mania-a-potu* an œdematous condition of the brain and its membranes, the so-called *wet brain*.

Symptoms. These are referable to the various organs and systems whose functions have been impaired and whose structure has been altered by the effect of the alcohol.

The Digestive System. Chronic catarrhal gastritis is an almost constant affection in the chronic alcoholic. It is evidenced by anorexia, foul tongue and breath, constipation, nausea and vomiting, especially before eating in the morning, the so-called "*water brash*." Often these symptoms are relieved by the day's first potation.

The liver is subject to definite changes partly as a result of chronic over-indulgence in alcohol and from accessory products used in manufacture, or in its adulteration which is wide-spread, or from additional substances introduced in "*blending*." From these arise symptoms in accordance with the existing conditions of cirrhosis, fatty degeneration, etc. These changes by no means always occur but are frequent and as a result of the compression of the portal circulation, due to the cirrhosis and consequent contraction of the new interstitial tissue, various manifestations appear, such as those due to congestion of the gastric mucous membrane, hæmorrhages from the alimentary tract, hæmorrhoids, splenic enlargement, etc. The characteristic facies of the alcoholic with its dilated veins, reddened nose—which is often the *acne rosacea* of the dermatologists—the swellings beneath the eyes and the icteric conjunctivæ, usually accompanies the disorders of the digestive tract and liver.

From the changes in the *circulatory system* the symptoms due to cardiac, renal and arterial disease result. Of these vertigo, apoplectic seizures and the various other manifestations of arterial degeneration are most important.

The Nervous System. Such symptoms as tremors of the hands and tongue and unsteadiness in the control of muscular acts are very common; the mentality is sluggish, the patient is irritable, restless, and deteriorates morally; the memory is impaired and the intellect becomes weakened generally; finally dementia and insanity may supervene. In women, inordinate jealousy, senseless fault-finding and eternal nagging should lead to an investigation of the sources of supply of alcohol; this is a difficult matter for they are frequently solitary drinkers. Multiple peripheral neuritis is frequent and will be considered elsewhere. Epilepsy may also occur as a sequence of chronic alcoholism but is likely to disappear with the resumption of proper habits. At times there develops with an alcoholic neuritis, and sometimes by itself, a peculiar condition characterized by hallucinations of sight, labial tremors, thickness of speech, confabulations, impairment of memory, pseudo-remiscences, disordered ideas of time and space and imaginative explanations of actual incidents, to which the term *psychosis polyneuritica* or *Korsakoff's psychosis* has been applied.

Changes in the nervous system are found after death but are not characteristic; of these hæmorrhagic pachymeningitis, thickening and opacities of the pial and arachnoid membranes, and even, in advanced instances, encephalomeningitis with meningeal adhesions should be mentioned.

Treatment. Chronic alcoholism can hardly be treated satisfactorily at the patient's home; success is far more readily attained at an institution where outside influences can be excluded, alcohol cannot be obtained unless considered advisable by the physician in charge and the patient can be kept under the strict supervision of attendants. An excellent substitute for institutional treatment is a prolonged sea voyage or a sojourn in the woods such as is afforded by a hunting or fishing trip where no alcohol is taken and the inebriate is associated with one or more congenial companions who are not drinkers. It is the present uniformly held belief that an entire withdrawal of the alcohol is better than a gradual "tapering off" unless the abstention results in an attack of delirium tremens, when it is usually necessary to allow the drug in varying amount. The substitution of narcotics, such as hydrated chloral, cocaine and the like, for alcohol is to be unhesitatingly condemned. Sleeplessness and nervousness may be controlled by the administration of the milder hypnotics such as the bromides, sulphonmethane (sulphonal), sulphonylmethane (trional), veronal, and paraldehyde. Morphine should not be used unless the patient's condition renders it absolutely necessary and other sedatives have failed. Even then it should not be prescribed as a routine but occasionally only, for the danger of acquiring the habit is great.

Hyoscine hydrobromide has recently been advocated as an excellent means of allaying the desire for alcohol and the nervous symptoms which follow its suspension. It may, if necessary, be given to the physiological limit even to the production of dryness of the mouth and delirium. Doses of one one-

hundredth of a grain (0.0006) may be administered hypodermatically every two or three hours until the nervous manifestations are relieved. These may be kept in a state of abatement by less frequent doses until the drug finally is entirely stopped.

The much exploited gold cures and other advertised institutional treatments are often fraudulent and the treatment is likely to be an empirical routine. None of the vegetable evacuants and alteratives produce in chronic alcoholism any other than the usual results obtained in other diseases from their use. Their exploitation and the extravagant claims made for them are merely methods of suggestion.

The addition of apomorphine or other substances to the liquor taken by the patient and the hypodermatic administration of the former drug after drinking may produce a distaste for alcohol. It has also been asserted that hypodermatic doses of one one-hundredth of a grain (0.0006) of atropine sulphate given several times a day will shortly render alcohol distasteful to the patient and productive of emesis without the addition of nauseating drugs.

During treatment the patient's digestion should be kept in as good condition as possible, the bowels should be regulated by means of mild laxatives or by occasional purgation with fractional doses of calomel followed by a saline, and stomachic bitters together with such tonics as strychnine and cinchona are useful. Any tendency to circulatory failure must be combated by the ordinary means, strychnine, digitalis, etc. Acute syncope or collapse necessitates the hypodermatic administration of diffusible cardiac stimulants, such as camphor and ether, and of the aromatic spirit of ammonia or the compound spirit of ether by mouth.

The diet should be nourishing, abundant, and easily digestible. Tea and coffee, on account of their stimulant properties, may be allowed.

Delirium Tremens.

Synonym. Mania-a-Potu.

Definition. An effect of the prolonged use of alcohol characterized by delirium with hallucinations and extreme prostration.

Symptoms. The syndrome, delirium tremens, is a result of the prolonged action of alcohol upon the cerebral cells but is often induced by a sudden withdrawal of the drug. Alcoholic excess in a temperate individual does not bring on an attack but a debauch may be followed, in the case of a chronic alcoholic, by typical *mania-a-potu*. Alcoholic subjects are very prone to attacks when prostrated by acute disease, particularly pneumonia. Delirium tremens is also a frequent consequence in alcoholics of a mental shock or physical injury such as a fractured limb or other result of traumatism. Prevention may be possible, in the latter instances, by allowing these patients alcohol in moderate quantity.

The onset of an attack is marked by sleeplessness, restlessness and depression; these symptoms are shortly succeeded by a delirium characterized by hallucinations of sight and hearing. Talking is continuous and incoherent, and restraint may be necessary, for the patient may desire to leave the house on imaginary business. The delusions of sight are almost always of a disagreeable nature and may take the form of animals, rats, mice, snakes, insects, etc., which the patient imagines are pursuing him or crawling about his bed or over his body. The fear induced is intense and constant watching is necessary to prevent attempts to escape. The hallucinations of hearing are less usual but conversations with imaginary persons may be carried on, imaginary voices and noises may be heard. Muscular tremor is marked and sleep is impossible. There is extreme weakness and the pulse is soft, frequent, compressible, and, perhaps, irregular. The temperature is elevated to 101° to 103° F. (38.3° to 39.5° C.) unless acute complications are present, when it is higher.

Diagnosis. This is simple. The patient should be thoroughly examined when first seen for surgical injuries, and daily physical examination of the lungs is necessary, for congestion at the bases is frequent and may develop into pneumonia; on the other hand pneumonia, especially that at the pulmonary apices, may be accompanied by a delirium resembling that of *mania-a-potu*. Meningitis, a serious form of which (*wet brain*), is often present, simulates in its symptoms delirium tremens, but may be differentiated from the latter condition by an absence of alcoholic history and the patient's appearance.

Prognosis. This varies, but, if there are no complications present, recovery usually takes place within a week, the hallucinations, sleeplessness and tremors gradually disappearing. In hospitals, however, the type of alcoholic subject generally observed is in a weakened and debilitated state and the death rate is consequently high, the patient gradually falling into the typhoid condition with feeble and dicrotic pulse, dry and cracked tongue, and low, muttering delirium; death from cardiac failure supervenes in a great number of instances. In patients who recover recurrences are common.

Treatment. The patient should be put to bed in a quiet darkened room; alcohol should be withdrawn unless its administration is necessary to combat adynamia; even if there is marked cardiac weakness in many instances it is preferable to stimulate by means of ammonia which is best administered as the solution of the acetate (liquor ammonii acetatis) in doses of one-half an ounce (15.0) repeated every two or three hours if necessary. The aromatic spirit is also useful and may be given in doses of one drachm (4.0). Strychnine sulphate, one-thirtieth of a grain (0.002) or more, if indications are present, may be employed as well.

The relief of the sleeplessness is most important and may be accomplished by the administration of the bromides and hydrated chloral, one-half drachm

(2.0) of sodium bromide with ten to fifteen grains (0.65 to 1.0) of hydrated chloral often being sufficient. Hydrated chloral, however, should not be employed if there is tendency to heart weakness. Excellent results in the alcoholic wards of hospitals may be obtained with paraldehyde in doses of two drachms (8.0) frequently repeated if necessary. Sulphonethylmethane (trional), in doses of ten to twenty grains (0.65 to 1.30), is also useful and often acts well when given in combination with five grains (0.30) of veronal. If the delirium is uncontrollable by other means hyoscine hydrobromide—one one-hundredth of a grain (0.0006)—may be given hypodermatically. Morphine should be administered with caution if at all; when all other measures fail it may be given hypodermatically in doses of one-fourth of a grain (0.016) but should seldom be repeated more than twice, the effects being watched with great care. The insomnia and restlessness is often relieved by a remedy for which there is no logical reason for its use; thirty grains (2.0) of powdered capsicum is frequently followed within half an hour by refreshing sleep of several hours' duration followed by a comfortable and quiet awakening. The patient is likely to remember the next evacuation of the bowels. Cold baths and hot or cold packs, repeated if necessary, are often useful in the relief of the restlessness. If there are symptoms indicating meningeal involvement (wet brain), such as stiffness and rigidity of the neck, etc., the ice cap should be applied.

Restraint is often necessary to keep the patient in bed, and here the employment of a folded sheet placed across the body and pinned under the mattress is to be preferred to straps.

At the beginning of the treatment the bowels should be freely moved and throughout the course of the affection the channels of elimination should be kept open by means of frequent draughts of water and laxatives when necessary. The patient's strength should be maintained by means of frequent feeding with easily digestible and assimilable foods, such as milk, peptonized if preferred, and nourishing soups. As the symptoms ameliorate a gradual return to ordinary diet should be allowed.

METHYL ALCOHOL POISONING.

Ætiology. Of late years numerous instances of poisoning by methyl (wood) alcohol or Columbian spirits have been reported; this is probably due in great measure to the fact that methyl alcohol is being used as a substitute for ethyl (grain) alcohol in the manufacture of many preparations, even medicinal ones. Even such substances as flavoring essences, etc., have been made with the cheaper alcohol, while it is common enough to find varnishes, bay rum, cologne, so-called witch hazel extracts and the like mixed with wood alcohol; it is probable, however, that the recently enacted pure food and drug laws will, to a great extent, do away with this pernicious form of adulteration.

Even the inhalation of the fumes of methyl alcohol, as may occur after the interiors of beer vats or small rooms have been varnished, may cause toxic symptoms, and it is quite probable that in susceptible individuals even a single "alcohol rub" may produce untoward manifestations through the absorption of the alcohol through the skin. The larger number of instances, however, of methyl alcohol intoxication are the result of drinking the fluid, either diluted with water or unknowingly in the form of adulterated liquors, ginger essence, cologne, etc. Idiosyncrasy apparently plays an important part in the type and severity of the toxic symptoms for, as stated by Buller and Wood, some individuals are largely immune so far as permanent damage to the organism is concerned. Of ten persons who take ten ounces (300.0) of Columbian spirit within three hours all will exhibit marked abdominal distress and four will die, two of these becoming blind before death takes place. Six will finally recover and of these two will remain permanently blind. If larger amounts than the above are taken the proportion of mortality and blindness will be greater.

Symptoms. Methyl alcohol intoxication occurs in an acute and a chronic type.

In the *acute type* the symptoms are, in general, analogous to those observed in individuals poisoned by grain alcohol (*see the section upon acute alcoholism*) but the manifestations are produced more slowly than is the case with the latter substance and the duration of the intoxication is more persistent.

The first noticeable symptom of acute methyl alcohol poisoning may be a state of exhilaration and excitement resembling that of ordinary drunkenness; in almost all instances the patients have complained of marked headache, nausea, active and persistent emesis and profuse perspiration. Pupillary dilatation is the rule, delirium is frequent and is usually followed by coma which may continue for several days and sometimes ends in death.

The most interesting and characteristic symptom of methyl alcohol intoxication is blindness; this has been observed in a large proportion of individuals who have suffered from the effects of excessive amounts of this substance and may be transient or permanent. Impairment of vision is very commonly seen and while in such instances the normal sight may be recovered, in those instances in which the blindness has been total it is a rare occurrence for the eyes to regain their normal power. The ocular disturbance may be the only symptom of the intoxication which is evidenced by the patient, here the blindness may not appear for several days after the ingestion of the alcohol. Following the incidence of the blindness the sight may temporarily return only to be lost again after a few days or weeks.

The amaurosis is the result of optic nerve atrophy; at times the color sense is chiefly affected and in other instances, while peripheral vision is preserved, the visual fields are contracted. Absolute central scotoma is very constant.

The fatal dose of methyl alcohol is variable; death has followed the ingestion of one-half pint (250.0) and in other instances considerably less than this quantity has brought about a fatal outcome.

Prognosis. This is distinctly bad. Death has followed large doses in a few hours, but in general it does not occur for a day or two.

Prevention. This may be to some extent accomplished by prohibiting the sale of deodorized methyl alcohol in all its forms. All preparations containing the substance should be labeled "poison" and individuals using it as an adulterant for food or drink should be prosecuted. When used in the arts it may be made undrinkable by the addition of a small percentage of naphthalin.

Treatment. The first indication is immediate emptying of the stomach by means of gastric lavage and the intestines by means of purgation and high rectal irrigations. The cardiac and respiratory weakness should be combated by such stimulants as ethyl alcohol, strychnine, digitalis, and caffeine. The collapse necessitates the employment of hot applications to the body and extremities in connection with rectal injections of hot coffee. It has been shown that the administration to animals of sodium bisulphite with methyl alcohol increases the formic acid output in the urine; as methyl alcohol is excreted, in part at least, in the form of this latter substance, sodium bisulphite might prove useful as a therapeutic agent.

Little is to be expected of treatment directed at the amaurosis. The use of pilocarpine, potassium iodide in the early stages, and the later administration of strychnine, is advised.

The chronic type of methyl alcohol intoxication may follow the frequent taking of small quantities of liquids (essence of ginger, peppermint, cologne, etc.) and is an insidious and doubtless not a rare form of poisoning. It is difficult of recognition in the absence of suggestive history, but it is quite certain that it results in disorders referable to the eyes and the digestive and nervous systems.

CHLORALISM.

Definition. The purposive habitual use of hydrated chloral.

The chloral habit is very easily acquired by individuals who have employed hydrated chloral in ordinary doses for even a short time for the relief of sleeplessness or any other purpose, and, once established, produces serious results and is difficult of cure.

Symptoms. The patient suffers from digestive disturbances and diarrhoea, extreme mental and physical weakness with sudden flushings due to vasomotor derangements, cardiac palpitation, and from erythematous eruptions, usually purplish in color, and especially affecting the face; sometimes they are found upon the mucous membranes. In some instances bed sores

and ulcerations appear. Dyspnœa, due to depression of the heart action and the respiration and the general bodily weakness, is a marked symptom; the temperature is often subnormal. The patient sleeps only when under the influence of the accustomed hypnotic and death in collapse may at any time follow an over-dose, since by reason of the cumulative effects of the poison in the system the vital functions are greatly impaired and elimination is rendered impossible. Sudden withdrawal of the drug may cause symptoms analogous to those of delirium tremens; such a condition is dangerous, as fatty degeneration of the heart is likely to be present.

Treatment. This should be carried out by gradual withdrawal of the drug. Isolation and careful attendance are necessary; stimulation of the heart by means of ammonia, strychnine and digitalis is indicated; the sleeplessness may be controlled by the bromides, sulphonmethane (sulphonal), sulphonethylmethane (trional) or veronal, a combination of the last two consisting of ten or fifteen grains (0.65 to 1.0) of trional to five grains (0.30) of veronal is often quite effectual. Morphine may be employed but only as a last resort. Tonics, plenty of nourishing food and congenial occupation, together with electricity and massage, are useful adjuncts to treatment.

SULPHONAL POISONING.

Fatal instances of poisoning by sulphonmethane (sulphonal) have been reported as occurring from small doses of this drug continued for long periods. The excretion of this substance seems to be slower than its absorption and consequently there is a tendency to a cumulative action. This may lead to gastritis, renal disease and certain not very clearly understood changes in the blood. As a result of the last there is a characteristic discoloration (port wine color) of the urine after it has been voided for an hour or two due to the presence in it of a reddish-brown pigment, hæmatoporphyrin, which is an iron-free product of the decomposition of hæmoglobin. This occurs chiefly in women and is associated with constipation, vomiting and gastric pain, weakness and ataxia, confusion and partial paralysis; eventually suppression of the urine, collapse and death may result. Though the continued use of the drug may not induce these grave manifestations it may be attended by severe functional disturbances such as mental, moral and physical deterioration, indigestion, impaired nutrition and cutaneous eruptions.

Enormous single doses have been known to cause paralysis of the sphincters, anuria, subnormal temperature and, as a late symptom, respiratory depression.

Treatment. The untoward effects of sulphonal can usually be avoided by intermitting its administration from time to time and by the daily use of the alkaline mineral waters either still or carbonated. When hæmatoporphyrinuria or other toxic symptoms have appeared the drug should be

stopped at once and thirty-grain (2.0) doses of sodium bicarbonate given every four hours. The treatment otherwise is symptomatic and supportive.

TRIONAL POISONING.

The symptoms resulting from the continued use of sulphonethylmethane (trional) are analogous to those of sulphonal poisoning. They consist of hebetude, drowsiness, anorexia, and muscular weakness; the frequency of the pulse is diminished and, in marked instances, vertigo, ataxia and, more rarely, hallucinations and delirium may be observed. Hæmatoporphyrinuria occurs and upon its appearance the administration of the drug should be immediately stopped.

Treatment. This consists, as in sulphonal intoxication, of the employment of means to favor elimination and to support the patient. The symptoms, as they arise, should be combated by the indicated measures.

VERONAL POISONING.

A few instances of poisoning due to diethyl-malonyl-urea (veronal) have been reported. In one patient its administration resulted in a febrile movement which lasted about a week, dryness of the mouth, a morbilliform rash upon the face, chest and arms, which later became confluent and was followed by a vesicular and bullous eruption upon the mucous membrane of the mouth and pharynx, conjunctivitis and aural pain. A dose of twenty-four grains (1.65) has produced symptoms of narcotic poisoning followed by a universal cutaneous erythema which recurred after a second dose, and in addition the patient suffered from periodic delirium.

The prolonged employment of veronal may result in the appearance of cerebral dulness, drowsiness, a staggering gait, nausea and vomiting, and hæmatoporphyrinuria.

Treatment. This consists in stopping the drug, alternation with hypnotics of other types, the administration of alkaline mineral water and securing a daily movement of the bowels.

MORPHINISM.

Synonyms. Morphinomania; The Morphine Habit.

The morphine habit is often acquired by patients for whom the drug has been prescribed by a physician to control obstinate pain or sleeplessness, or more frequently from self-administration or the use of certain patent medicines. It is particularly frequent among women who are afflicted with painful conditions and among physicians themselves. Individuals of neurotic tendency are more subject to the contraction of the habit than those

whose nervous systems are stable, and heredity is a recognized predisposing ætiological factor. Alcoholics often become morphine *habitues*, the drug being first taken as an aid in the attempt to overcome the craving for liquor. The morphine is taken either by mouth or hypodermatically, and, while certain subjects continue to take the same small quantity of the drug, the tendency is to gradually increase the amount until thirty grains (2.0) a day or even more are employed. In the East opium eating and smoking are as common as the use of tobacco is with us but the Oriental constitution seems much better able to withstand the effects of the drug than does that of the Caucasian.

Symptoms. The continued use of small doses of morphine may for a long time result in no marked manifestations other than a craving for the drug, but sooner or later the functions of both body and mind become affected. While under the influence of the morphine the patient may feel well, but as the effects disappear mental disquietude, depression, nausea and perhaps colicky abdominal pain follow, which can be relieved only by further recourse to the drug. The character of the morphinomaniac becomes deteriorated and is typified by lack of self-control and of moral sense—the subjects of the habit being notoriously untruthful—there is an irritability of temperament, sleeplessness is frequent, the appetite is poor and nutrition becomes impaired; the pulse is weak and rapid, sweating and itching of the skin are common and constipation is the rule. The appearance of the patient is somewhat typical, the skin being sallow, the pupils dilated and the facies prematurely aged; oedema of the limbs may be present. When under the influence of the drug the pupils are contracted and the mental and physical condition usually seems much more normal. Morphine *habitues* finally become subject to muscular tremors, and, women particularly, are likely to exhibit hysteric and neurasthenic symptoms. The deteriorated constitution becomes an easy prey to disease and usually the end comes as a result of intercurrent affection or of a weakness induced by the lack of the maintenance of nutrition.

Certain subjects live to moderate old age and even, though the habit is continued, are able to transact the usual duties of life; these, however, are generally rare individuals who get along upon a small and not increased quantity of the drug.

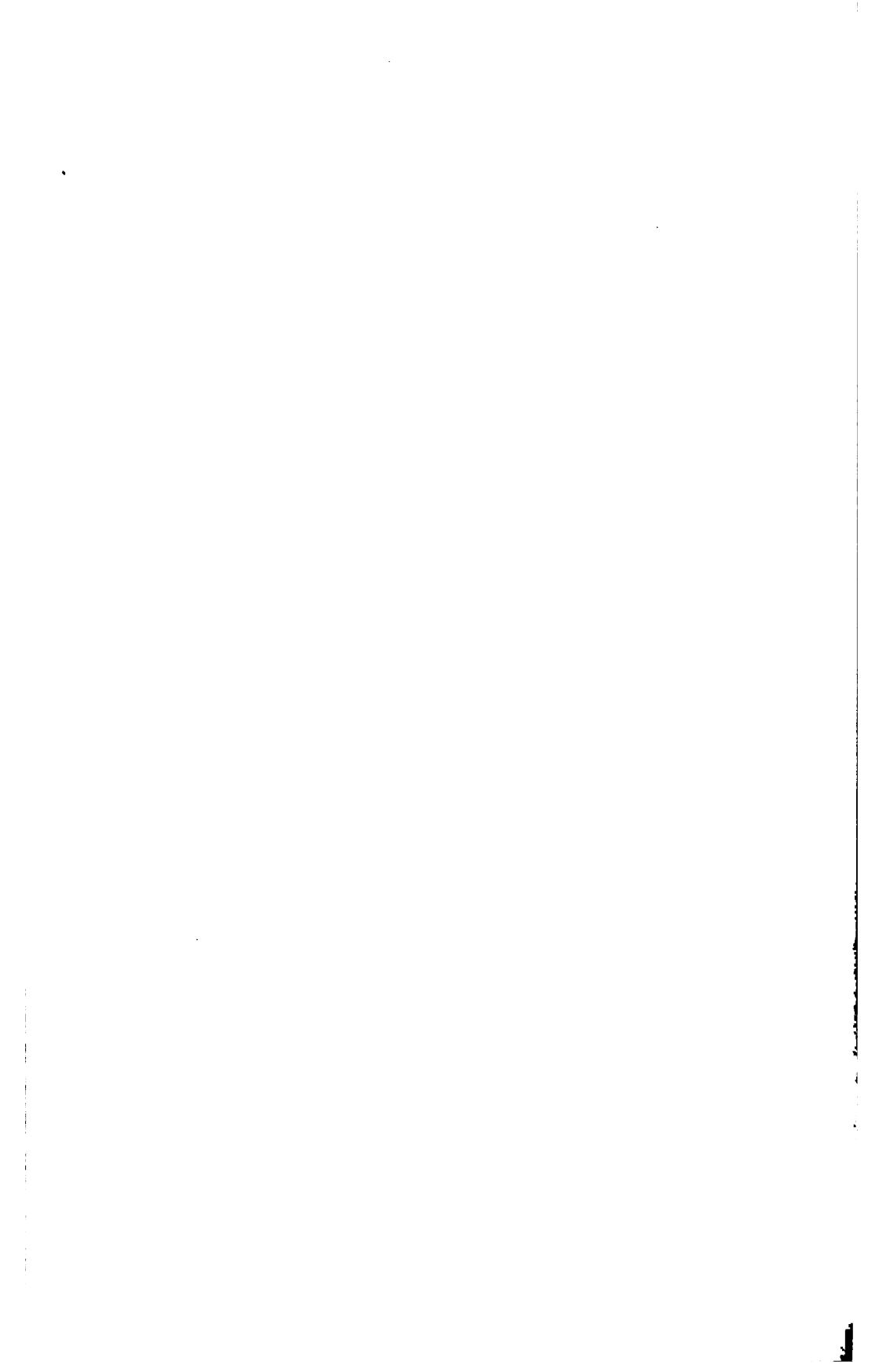
Prognosis. This is variable, depending upon the strength of character of the patient and upon his surroundings. Relapse is very common.

Treatment. Much may be done by the physician in the way of prevention of the morphine habit. The indiscriminate prescribing of the drug cannot be too strongly condemned and it is a positive crime to put a hypodermatic syringe into the hands of a patient to be used in the control of pain or sleeplessness. When morphine is indicated it is an invaluable drug, but it is best not to tell the patient that he is receiving it, and all prescriptions

should be marked "Not to be refilled without order of the physician." The best plan is never to write a prescription for opium or any of its narcotic alkaloids but, when it is necessary for a patient, to supply the quantity which is likely to be required and no more.

In the treatment of morphinism institutional seclusion is an absolute essential, for the closest watchfulness upon the part of the attendants cannot prevent the patient from procuring the drug if he is in his own home; even in institutions it is often difficult to prevent his access to morphine for friends may be persuaded and servants bribed to obtain it for him. The treatment is one offering immense difficulties at best, on account of the degraded moral condition of the *habitué* and is very frequently unsuccessful in effecting a cure. Isolation is necessary and the patient should be watched with the utmost vigilance to prevent him from securing the drug surreptitiously. The morphine must not be withdrawn suddenly, since this is likely to be attended by collapse and aggravated mental disturbance, but the quantity should be gradually diminished until it is considered wise to stop it altogether, which can usually be done at the end of about a week. The withdrawal of the morphine is followed in many instances by diarrhoea, insomnia, irritability and extreme mental and bodily depression. Medication is often necessary to combat these symptoms. Stimulation of the heart, if weakness is present, by means of ammonium carbonate, strychnine, digitalis or caffeine may be indicated; alcohol should not be employed on account of the possibility of inducing its habitual use; cocaine is contra-indicated for the same reason. The gastric symptoms should be relieved by appropriate methods, and the same is true of constipation and diarrhoea. The intestinal atony which is the cause of the former is best combated by the administration of physostigmine salicylate in doses of one one-hundredth of a grain (0.0006) twice a day; the diarrhoea may be controlled by bismuth subsalicylate in twenty-grain (1.30) doses every four hours or by other salts of this metal with vegetable astringents. The appetite may be stimulated by means of the vegetable bitters and by palatable and highly seasoned food, plenty of nourishment being an important consideration; plenty of milk and rich broths should be given. The insomnia and nervous irritability may be relieved by the bromides, sulphonmethane (sulphonal) in doses of twenty grains (1.30) in warm milk, sulphonethylmethane (trional) or veronal in doses of ten to fifteen grains (0.65 to 1.0), and by chloralformamide (chloralamide) in doses of fifteen grains (1.0). Hydrated chloral may be employed in emergency but the possibility of habit formation must not be forgotten; this drug is contra-indicated in the presence of cardiac weakness. Even morphine itself is sometimes necessary. The mental excitement may often be controlled by warm or cold baths or packs.

Within the past few years treatment by means of the systematic administration of hyoscine hydrobromide has been advocated. The patient



is placed under the careful supervision of attendants, the morphine is stopped and hyoscine is given hypodermatically in large quantity, even as much as one one-hundredth of a grain (0.0006) every two or three hours, until the restlessness and nervous irritability are under control. Sleep may not ensue but a condition of semi-stupor may be produced during which the patient often talks incoherently. The physiological effect of the drug as evidenced by dryness of the mouth may not be noticeable. The patient is kept under the influence of the hyoscine for several days until the more acute craving for morphine has disappeared, the effects of the drug are then allowed to wear off and in fortunate instances the patient may have been weaned from his habit. The patient must not be left alone while under this treatment. If there are signs of cardiac failure, stimulation by means of strychnine is indicated and must be promptly administered. Rather remarkable cures have been reported as resulting from this treatment, but relapse is as common as after other forms.

In conclusion it may be asserted that no known drug appears to possess any specific effect in controlling morphinomania; no reliance can be placed upon any of the advertised cures; most of these contain morphine and are consequently ineffectual, the others are made up of inert drugs and are frauds.

HASCHISCH (CANNABIS INDICA) POISONING.

Haschisch is largely employed in the Orient as a stimulant of the psychic functions and its moderate use does not seem to be attended by injurious effects. When taken to excess it leads to tremor, loss of appetite, muscular weakness, and sometimes to mania and dementia. In some severe instances convulsive attacks have been observed and among the natives of India catalepsy is said to occur at times. The drug, if employed by Caucasians, would probably cause more serious results than are usual among Orientals.

Death from acute poisoning is rare, and recovery has taken place after very large doses. Shortly after the administration of the drug the patient experiences most pleasurable emotions, everything seems to amuse him, he becomes hilarious and indulges in actions which he realizes to be ridiculous but in which he takes much pleasure; double consciousness is well marked. The patient is on the best of terms with those about him and passes into a dreamy, semi-conscious state in which he experiences ideas upon the most magnificent scale; time and space appear to be indefinitely extended. He may say brilliant or witty things but there is little relevance in his thought, which changes rapidly from one subject to another. He experiences delightful visions; true hallucinations may be present. The general sensibility is much diminished and even complete anæsthesia may be noted. The pupil is usually somewhat dilated; later the dreams alternate with conscious periods and ultimately the patient falls into a quiet

slumber from which he awakes without any sensation of depression, but refreshed and ravenously hungry.

The effects of *cannabis indica* vary greatly in different individuals as a result of personal peculiarities or of variations in the strength of the drug. Dryness of the mouth, thirst and strangury are occasional untoward symptoms.

Treatment. The treatment of acute poisoning by *cannabis indica* consists in emptying the stomach by lavage or emetics and the bowels by a purge; otherwise the management of the condition is symptomatic. In chronic *haschisch* intoxication the use of the drug should be stopped. Otherwise the treatment of the condition is symptomatic, eliminative and supportive.

COCAINISM.

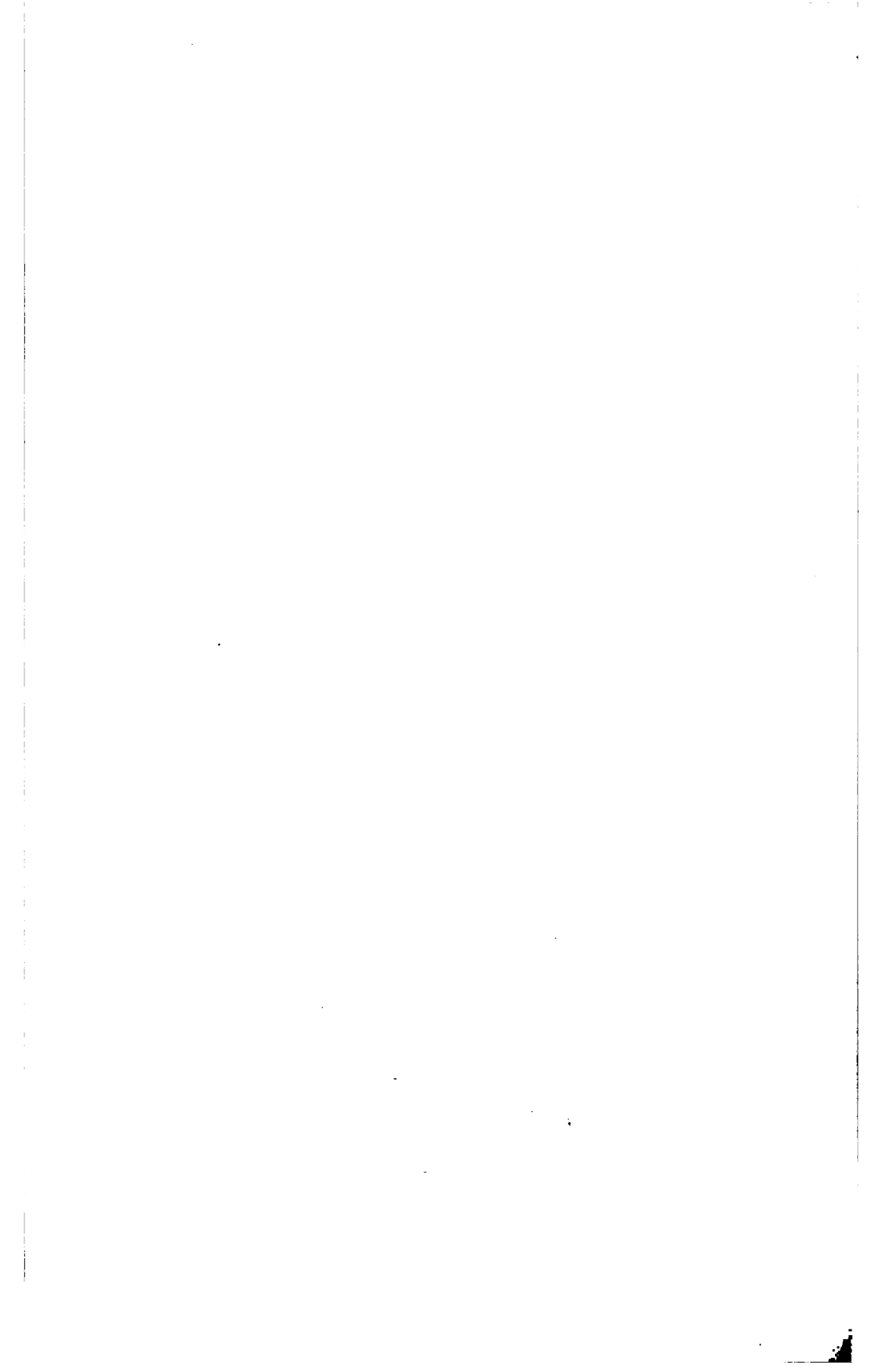
The habitual use of cocaine is not at all infrequent. To it physicians are particularly prone, acquiring a desire for the effects of the drug as a result of its employment as a nasal or pharyngeal application. Laryngologists have induced the habit in these patients by unnecessarily prolonged use of the remedy. The habit may also be induced by the substitution of cocaine for morphine in the treatment of morphinomania. Cocainism is said to be quite common among the negroes in certain parts of the south. Neurotic individuals are more susceptible to this and other drug habits than persons of normal mental balance.

Symptoms. The victim of cocainism rapidly becomes emaciated and is subject to attacks of syncope. Circulatory disturbances, a feeble, thready pulse, insomnia, ocular disorders, such as amblyopia, mydriasis, and nystagmus, mental failure and delusions not unlike those of chronic alcoholism may be observed. Visual and other hallucinations, usually of disagreeable character are often present and one symptom which is regarded as typical of sub-acute or chronic intoxication with this drug is a sensation of crawling worms (Magnan's sign) or insects ("cocaine bugs") under the skin. Sometimes there is delirium or acute mania. There seems to be a degeneration of the central nervous system similar to that which occurs in chronic morphinism. The moral deterioration which results is fully as marked as that observed in morphinomania. Cocaine is usually taken by hypodermatic injection; more rarely the powder itself is used as a snuff.

Treatment. Physicians should never prescribe the remedy so that the patient can obtain it for himself. Laryngologists should so far as possible substitute other drugs for their local treatment. Cure is often ~~difficult~~ particularly if the habit is associated with morphinism or alcoholism. Relapses are frequent. The most important point in treatment is the withdrawal of the drug; it must be remembered, however, that sudden stopping of it may cause profound collapse. The result is seldom successful unless

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impossible



the patient is confined in an institution for considerable time and placed under the care of competent and faithful attendants. Tonics and stimulants are indicated just as in the treatment of chronic morphine poisoning. Plenty of nourishing food is necessary and the nervous manifestations should be controlled as in morphinism.

TOBACCO POISONING.

The symptoms which result from the over-use of tobacco by smoking, chewing or snuff taking are chiefly referable to the digestive and nervous systems. The tongue is coated, the breath is foul, and there is chronic catarrh of the pharynx and larynx; nausea, vomiting, flatulence and constipation are common. Insomnia, muscular weakness, tremors and even ataxic symptoms may be observed. Amblyopia and scotoma may develop and cardiac palpitation and irregularity (*the tobacco heart*), sometimes with anginal and asthmatic attacks, are frequent. In prolonged instances the skin becomes shallow and the body emaciated.

Treatment. This consists in the absolute interdiction of the tobacco; this may cause marked nervous irritability and the craving for the drug for a few days is often very difficult to withstand. The sleeplessness and nervousness should be controlled by the bromides, sulphonmethane (sulphonal) or sulphonethylmethane (trional) and the cardiac condition may be relieved as suggested in the sections upon the treatment of cardiac irregularity and palpitation. The fluidextract of *cactus grandiflorus*, made from the green plant, thirty drops (2.00) thrice daily usually relieves the latter symptom. Tonics and nourishing food are useful adjuncts to the treatment.

The employment of apomorphine hydrochloride in doses of one-thirtieth of a grain (0.002) every two hours, gradually increasing the amount until slight nausea is experienced, has been suggested.

CARBON DISULPHIDE POISONING.

This substance is employed in the arts and especially in the vulcanization of rubber. Individuals exposed to its fumes may become emaciated and affected with headache, vertigo, nervous excitement, inco-ordination of movement, and depression of the special senses with impairment of sensation and motility. Insanity is said to result in some instances. Chronic intoxication may be evidenced by a neuritis with paralysis analogous to that occurring in plumbism.

Carbon disulphide, when directly inhaled, excites violent coughing, and causes general anæsthesia with intense muscular rigidity. The drug is a powerful heart depressant, and even in small doses by mouth produces severe nausea and vomiting, with a burning sensation in the epigastrium, and a weak and rapid heart action.

Treatment. Something may be done toward the prevention of carbon disulphide poisoning by effecting free ventilation of the rooms in which the substance is used. Inhalers have been suggested, but, unless they are so constructed as to separate the toxic fumes from the inspired air, can be of little value. The treatment of the affection is wholly symptomatic. Phosphorus may be employed to combat the nervous manifestations.

CARBON MONOXIDE POISONING.

Synonyms. Illuminating Gas Poisoning; Combustion Products Poisoning.

Ætiology. Exposure to this gas when generated by an electric furnace, from the escape of illuminating gas, especially what is known as water gas, into closed apartments, and from the use of various heating and industrial devices.

Pathology. There are red or reddish-blue spots on the body, the blood is cherry-red, the muscles are markedly degenerated, there is intense hyperæmia and even small hæmorrhage in all the organs, even in the brain. In the more chronic forms there are various respiratory changes, bronchitis and even pneumonia, nephritis, neuritis, cardiac dilatation, anæmia and enlargement of the spleen.

Symptoms. There is apt to be severe headache, vertigo, marked muscular weakness, nausea and vomiting, drowsiness and, with inhalation of large amount, coma with loss of control of the sphincters. Cynosis and the spots above described are evident. After recovery from acute poisoning or in insidious instances, there may be symptoms of pulmonary invasion or those suggesting enteric fever. Various nervous symptoms even to those of Landry's paralysis or multiple sclerosis have been observed. The peculiarity of all these secondary conditions is the late period at which they develop.

Diagnosis. This is made upon the history of exposure and the characteristic color of the blood and the absorption bands of its spectrum.

Prognosis. In acute poisoning recovery follows if prompt treatment is instituted, but it must be guarded for at least six weeks. If leukocytosis is of high degree it is usually unfavorable.

Treatment. In acute poisoning the patient must be immediately removed from the room and oxygen freely inhaled. If the patient is comatose venesection should be practised and a larger amount of sterile normal salt solution introduced in the vein. Artificial respiration should be persisted in. Often strychnine must be administered hypodermatically in generous doses. Promptitude and persistency will often save apparently hopeless instances of this poisoning. In chronic poisoning the cause must be removed and attention paid to the secondary manifestations, of which anæmia is always important.





LACQUER POISONING.

Workers in lacquer, which is manufactured from the balsamic gum of *Rhus vernicifera*, are subject to a distressing poisoning, the manifestations of which are cutaneous. This form of intoxication is observed chiefly in China and Japan and occurs both as a result of contact with the lacquer in its raw state and from inhalation of the air of apartments in which newly lacquered articles are exposed. The symptoms appear within a few hours after association with the poisonous substance and are evidenced by intense pruritus of the skin of the face, arms and legs; cutaneous œdema follows and papules appear which later become vesicles containing a yellowish sero-purulent fluid. Coalescence of the vesicles may take place. A rise of temperature is observed in severe instances. If the eruption upon the face is intense in character the mucous membranes of the lips and conjunctivæ may be involved as well. The eruption is said not to appear upon the trunk, only the face, limbs and scrotum being subject to this manifestation.

Treatment. This consists in the application of lotions calculated to allay the irritation. Of these lime water and a solution of sodium thiosulphate, one part to eight, should be effective. Dressings of the National Formulary solution of alum acetate may be applied if the pustulation is marked.

FOOD POISONING.

Various forms of food when decomposed, contaminated or improperly prepared may cause toxic symptoms. In great measure the symptoms produced are caused by the presence of substances generated in the decomposition of organic matter. These basic alkaloidal substances, formed in putrefaction, have been termed *ptomaines* and occur in different types, some poisonous, others harmless; certain ptomaines may be innocuous under some conditions and under different circumstances markedly toxic.

Meat Poisoning (*Kreotoxismus*) follows the ingestion of decomposed flesh. The most frequent form is sausage poisoning (*Botulismus* or *Allantiasis*) and is probably due to the employment of improper methods of preparation. Diseased raw meats and those partially cooked have given rise to serious symptoms but on the other hand thorough cooking may fail to make the food safe. Ham poisoning sometimes occurs and other meats have been known to cause toxic symptoms. Among these may be mentioned beef, veal, fowl, etc. The practice of placing undrawn poultry in cold-storage should be forbidden, instead of required, by law, especially if kept too long a period after being thawed out when taken from cold-storage. Gärtner's bacillus, the *bacillus enteritides*, is probably the immediate cause of kreotoxismus. Cured meats are responsible at times, and, while the tin or zinc chloride derived from the cans may be at fault occasionally, the meat itself is often at the bottom of the evil.

Symptoms. These appear after an interval of from a few hours to a day or two and are evidenced by the manifestations of severe gastro-intestinal irritation. There are nausea, vomiting, abdominal pain and diarrhoea. The temperature is often elevated, and dryness of the mouth, thirst, dysphagia, headache, dizziness, dimness of sight and pupillary dilatation may be present; even delirium is observed at times. In instances which terminate in death the patient passes into a condition of collapse with muscular twitchings, cramps in the legs, coldness of the extremities with cardiac and respiratory depression.

Diagnosis. The symptoms resemble arsenical poisoning excepting that the pupils are usually dilated and the muscular weakness may be so great as to suggest paralysis.

Poisoning by Fish (*Ichthyotoxismus*) and Shell Fish. Certain fish are known not to be fit for food, while others, edible at ordinary times, are poisonous during the spawning season. Diseased or decomposed fish, which in its normal condition and when fresh, is good to eat, may produce toxic symptoms under the former circumstances. Spoiled canned fish and shell fish are the most frequent causes of fish poisoning.

Shell fish, particularly mussels, may also cause poisoning (*Mytilotoxismus*). The poison is found chiefly in the liver of the bivalve and it is not known whether a certain species is always toxic or ordinary mussels become poisonous under special circumstances.

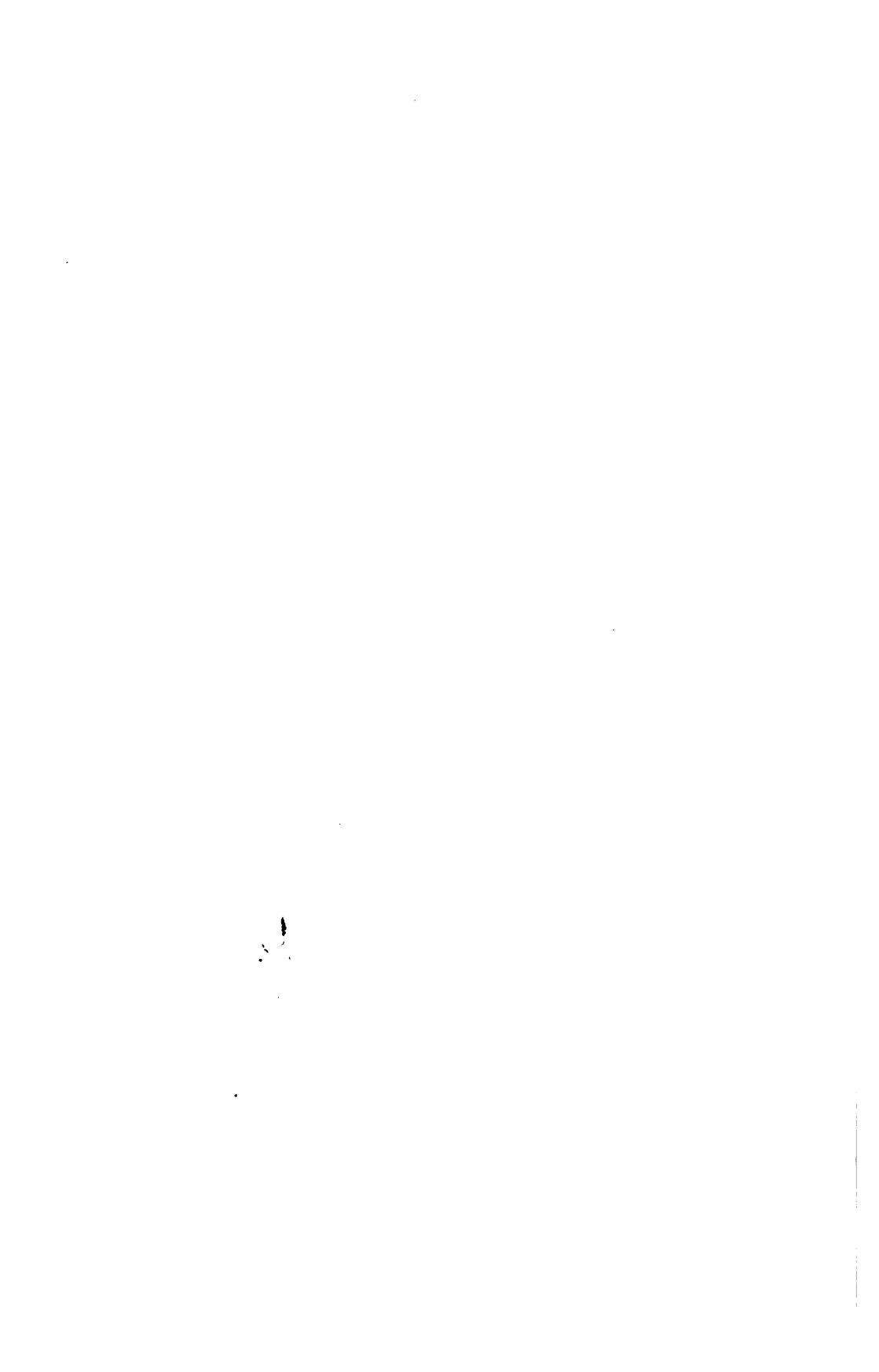
Symptoms. Fish poisoning is marked by similar manifestations to those of meat intoxication. The symptoms are often intense and a generalized scarlatiniform rash may appear.

Mussel poisoning is evidenced by marked gastro-enteric irritation and frequently by the development of an urticarial eruption which may become vesicular; marked oedema of the eyelids is not uncommon. In frequent instances nervous symptoms such as convulsions, paralysis, delirium and coma are observed—death is not rare. In another type of poisoning severe choleraic symptoms may be followed by rapid respiration and heart action, numbness and coldness of the extremities, dilated pupils, and fatal collapse.

Poisoning by Dairy Products. Milk intoxication (*Galactotoxismus*) may follow the ingestion of decomposed milk, and poisoning from cheese and ice cream (*Tyrottoxismus*) may result from the presence of a ptomaine (*tyrototoxicin*) which has been isolated by Vaughan.

Symptoms. These are marked gastro-intestinal irritation, constriction of the fauces, nausea, vomiting, intestinal cramps, and sometimes purging. In the more severe forms coma, subnormal temperature and collapse precede death. The summer diarrhoeas of children are doubtless largely due to this form of poisoning.

Treatment of Food Intoxication. The first indication is to remove the poisonous substance from the digestive tract. The vomiting induced by the



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presence of the offending food is usually sufficient to relieve the stomach of its contents but if not we should have recourse to gastric lavage. The intestine should be emptied by repeated fractional doses of calomel followed by a saline. The abdominal cramps may be relieved by the application of hot water bags or compresses and by the hypodermatic injection of morphine, if necessary. The tendency to collapse should be combated by the hypodermatic administration of alcohol and strychnine and, when the gastric irritation has passed, by stimulants by mouth. Feeding should be begun with care, milk diluted with one of the carbonated waters being first allowed. The treatment in other regards is symptomatic.

GRAIN POISONING.

The employment of various kinds of diseased or decayed grain as food is a common source of intoxication in certain countries.

Ergotism occurs among the lower classes in Europe where, after poor harvests the indigent are obliged to use bread made from rye contaminated with the *sclerotium*, an intermediate stage of development, of the *claviceps purpurea*, a fungus which attacks the rye grain. The disease is less common now than formerly.

Symptoms. Two types of ergotism are recognized. (1) The *gangrenous form*, which commences as follows: The onset of the affection is marked by anxiety and weariness, gastro-intestinal irritation, and sometimes by a slight rise in temperature. There is a sensation of formication, itching and tingling of the surface, chiefly on the fingers and toes; these manifestations are followed by numbness and local anæsthesia. Sometimes anæsthesia and hyperæsthesia are found at the same time in different parts or even in the same part; these symptoms begin in the extremities and spread thence over the whole body. The sensory disturbance may affect the digestive tract so that there may be present either voracious hunger or anorexia. In from a few days to a month a redness, akin to that of erysipelas, appears in the fingers, toes or upon the nose or ears. Subsequently a dry gangrene usually develops, but in certain instances the wet type of the affection appears. The process may involve an entire extremity or affect merely a finger or toe. The gangrene is due to vascular contraction, with stasis of the blood current, and coagulation with hyaline thrombosis.

(2) *The convulsive form.* The difference in the varieties of ergotism are explained by the different actions of the constituents of the ergot and by the fact that they may act in part directly upon the blood-vessels and in part directly upon the central nervous system.

At the same time as the sensory symptoms mentioned above, there appear weakness and depression, often with severe headache and vertigo, as well as central disturbances of the special senses, such as impairment of sight

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and hearing. Convulsions may follow, usually clonic in character and often epileptiform; subsequently contractures in the muscles of the limbs and sometimes in those of the trunk may develop.

In some epidemics both the gangrenous and convulsive forms have been observed but usually one has been much more prevalent than the other.

Prognosis. Formerly the disease was immediately fatal in a large proportion of patients and when recovery took place it was likely to be associated with more or less loss of intellectual power and, in some instances, with complete dementia.

Treatment. Ergotism may be wholly prevented by inspection of the rye used for flour and by destroying all suspicious grain. The treatment consists in stopping the unwholesome food and substituting that which is wholesome. The symptoms should be treated as indicated. For the muscular contractures massage, hot bathing and electricity are useful.

Pellagra (*Maidism*) is due to the use of diseased maize as a food. Not only does the affection result from eating the grain itself but it may also follow the use of products made from the corn. A ptomaine which causes analogous symptoms in animals has been extracted from the meal of diseased maize and from the fungi, which affect the corn, a body which will also cause the symptoms of pellagra has been isolated. Pellagra occurs in Italy, Hungary, Southern France, Spain, Mexico and Yucatan and to a considerable extent in the Southern States. Adults are chiefly attacked although children may also be affected. Alcoholism is believed to be a very potent predisposing factor. Poor general condition and malaria also predispose to the affection.

Symptoms. The disease, in most instances, is first evidenced by weakness, malaise, indigestion, and pain in the head and back; sleeplessness is common and there may be mental disorder. These symptoms usually appear in winter and with the appearance of spring the typical cutaneous manifestations of pellagra show themselves. These consist of an erythematous eruption which is followed by scaling and wrinkling of the skin, particularly that of parts which are not covered by clothing; the usual duration of the rash is several weeks, desquamation then takes place leaving the skin thickened and scaly. With the cutaneous symptoms there are digestive disorders such as salivation, loss of appetite, flatulence and diarrhoea. With the incidence of summer amelioration takes place but there is a recurrence of the symptoms with the following spring. The sequence of improvement in summer and relapses in the spring continues until the patient becomes affected with a chronic debility which amounts to a cachexia with which various nervous manifestations are associated; spastic paralyses of the lower limbs with atrophy and contractures occur and the deep reflexes are exaggerated. Dorsal and cephalic pain, girdle sensations and tingling and itching of the skin are observed. The special senses are impaired. Mental symptoms are common; the patient is melancholic and may attempt suicide, mania is some-

times noted and the final stage of the affection is a permanent dementia. Confinement in hospitals for the insane is frequently necessary. In the protracted instances of the disease the patient has the appearance of premature mental and physical old age with marked cachexia.

Prognosis. As to recovery after several successive attacks this is unfavorable; the course of the affection may last for twelve or fifteen years.

Treatment. As a preventive measure no diseased corn should be used as food or in the manufacture of other products. A rigid inspection of all maize should be instituted and suspicious grain should be destroyed. Proper methods of cooking should be inculcated and that cooked should be eaten within a short time. Alcohol should be forbidden. A change of climate often is of great benefit. Recent experiments in producing active immunization, by means of a serum obtained from a pellagrous mule, have not been sufficiently extensive or of long enough duration to warrant an opinion as to their value. Strychnine and quinine in large doses and especially arsenic are recommended. The symptoms referable to the motor system necessitate the employment of hot baths, massage and electricity. The affected cutaneous areas should be anointed with oily substances to prevent, if possible, the thickening and stiffening of the skin, and the itching may be relieved by the application of various antipruritics.

Lathyrism, Lupinosis or Chick-pea Disease is an affection due to the use as food of chick-peas or vetches, particularly the varieties *lathyrus sativus*, *lathyrus cicera* and *lathyrus clymenum*, the German, the red and the Spanish vetches. The peas themselves cause the disease, decay having no influence in its production. The intoxication is observed in Italy, France, Algiers and India where meal from the chick-pea is mixed with the flour of barley or wheat. Exposure to cold and wet is considered to be a predisposing factor in the causation of the affection.

Symptoms. There is sometimes a prodromal stage characterized by gastro-intestinal irritation with gastric disturbance, diarrhoea and a rise of temperature; following this there is pain in the back and legs with tremors and weakness. Later a condition of spastic paralysis, which may continue to complete sensory and motor paraplegia, develops. There are no disturbances of sensation and the sphincters are rarely involved. The reflexes are exaggerated. The arms are not affected.

Lathyrism seldom results fatally but the course of the affection is protracted and the paralysis is, as a rule, permanent.

Treatment. This consists in the avoidance of chick-pea meal as a food and in the employment of means calculated to relieve the symptoms. Strong counter-irritation over the lumbar region is recommended.

Atriplicism is the term applied to poisoning resulting from eating the *coast orach*. In China the *atriplex augustissima* and the *atriplex serrata* are

used by the natives as food, either raw or cooked in dough. The intoxication is characterized by the appearance, within twelve to twenty-four hours, of numbness, coldness and tingling in the fingers and backs of the hands. Pruritus and oedema follow and spread to the elbow. Later the face is affected. The symptoms persist for several days and are followed by desquamation. In marked instances vesicles which may ulcerate appear and gangrene of the fingers has been observed. The resemblance of this condition to erythromelalgia has been remarked.

Treatment. The offending substance should be removed from the intestinal tract by inducing free movements of the bowels. The local manifestations may be relieved by the application of soothing lotions.

EFFECTS OF EXPOSURE TO HIGH TEMPERATURES.

HEAT EXHAUSTION.

Definition. A condition of prostration characterized by a tendency to syncope, vasomotor paralysis and subnormal temperature and resulting from over-exertion under high temperature. Exposure to the direct rays of the sun is unnecessary in the production of this affection since it may be due to the influence of artificial heat, such as that of the stoke-hole of steamships. It is more frequent in chronic alcoholic subjects. It may occur in infants during hot weather.

Symptoms. These consist of intense bodily weakness and in the more marked instances, of syncope, pallor, vertigo, impairment of vision, and coldness of the surface. There is a clammy perspiration. The unconsciousness which often results is usually followed by sleep from which the patient wakes within an hour or two in a normal condition.

In intense instances the collapse is more marked, the heart action is depressed, the perspiration continues and is accompanied by restlessness and even delirium. The temperature may fall as low as 95° F. (35° C.).

Heat exhaustion is easily differentiated from true sun-stroke by the fact that in the former condition the bodily temperature is below the normal. In an ordinary attack of fainting the drop in temperature is less extreme.

Treatment. The patient should be placed upon his back with the head only slightly, if at all, elevated, in a cool airy and shaded place. The clothing should be loosened. Stimulation may be administered by mouth or, if the condition necessitates its more immediate action, hypodermatically. The diffusible stimulants are to be preferred, alcohol and ammonia usually being quickly available; strychnine also may be employed. For the lowered temperature frictions should be instituted and hot-water bags or hot compresses should be applied to the body and extremities.

SUN-STROKE.

Synonyms. Thermic Fever; Insolation.

Definition. A condition caused by exposure to extremes of heat and characterized by high fever, cerebral and pulmonary congestion and marked prostration.

Ætiology. Sun-stroke is common in the United States during the hot months among those whose occupations necessitate prolonged exposure to the rays of the sun or who are employed under shelter where the temperature is markedly high, as in the fire-rooms of steamers, bakeries, sugar refineries, laundries, etc. Soldiers on the march are frequent sufferers.

Alcoholic individuals and those of plethoric habits seem especially prone to the affection. The infectious origin of sun-stroke has been suggested upon the ground that it occurs in epidemics in certain localities and more particularly in those unaccustomed to extraordinary temperatures.

Pathology. The production of thermic fever is explained upon the ground that when exposed to the effects of high temperature the heat center is so affected that it cannot rid the organism of the rapidly accumulating heat. As a result of this impairment of the elimination of heat the body temperature rises. Finally the heat center becomes exhausted in its effort to control heat production or paralyzed by the action of the excessive temperature already reached; all at once the tissues begin to form heat with great rapidity, the bodily temperature suddenly rises and the organism is overwhelmed.

After death the body retains its heat for a considerable time; *rigor mortis* and decomposition occur rapidly and the blood seldom coagulates. There is universal venous congestion, this being particularly marked in the cerebrum and lungs. The left ventricle of the heart is contracted and the right is in a condition of dilation. There may be parenchymatous degeneration of the liver and kidneys.

Symptoms. The initiatory manifestations are usually a sensation of intense heat, headache, vertigo, oppression and sometimes nausea, vomiting and diarrhœa. Colored vision (*chromatopsia*) may be experienced. Unconsciousness with marked restlessness and even delirium may follow. The skin is flushed, hot and dry, the temperature ranges from 104° to 112° F. (40° to 44.4° C.) or even higher, the pulse is rapid and full, the respiration difficult and perhaps stertorous. There is pupillary dilation in the early stages, later contraction is present. In most instances the muscles are relaxed, but twitchings or even epileptiform convulsions are sometimes observed. Perspiration may re-appear as a late symptom but has no influence in lessening the height of the temperature. The urine is diminished and may contain albumin. In favorable instances a fall in the bodily temperature is accompanied by a remission of the other symptoms. Complete recovery may ensue or the patient may be left with nervous and mental disturbances varying

from simple loss of memory to insanity. A common sequel is an inability to endure even slight degrees of heat; individuals possessing this idiosyncrasy may become very uncomfortable at as low a temperature as 80° F. (26.7° C.).

In fatal sun-stroke the temperature remains high, the unconsciousness becomes more profound, the heart weakens, the respiration becomes rapid and shallow and death supervenes, usually in from twelve to thirty-six hours. In another type of the affection the patient may die suddenly or within a short time after the onset with the symptoms of cardiac failure such as rapid and almost imperceptible pulse, marked dyspnoea and coma.

Sun traumatism may be defined as a morbid condition in which sudden death from paralysis of the heart or respiration follows exposure to the sun. If death does not occur the symptoms are those of meningitis from which recovery may take place with more or less persistent tremor, disturbance of vision and audition, perchance epilepsy or finally paresis or paralysis of the extremities.

Siriasis is a specific disease developing in high atmospheric temperatures but not caused by it but probably by a micro-organism which thrives under such conditions. It presents symptoms identical with those of sunstroke but is rather to be applied to those instances in which hyperpyrexia, coma, cerebral and pulmonary congestion are especially prominent. Its mortality is above twenty-five percent.

The *Florida fever, continued thermic fever, or country fever* which occurs in warm and tropical climates is a continued fever which has been attributed to prolonged exposure to a high temperature although of late its septic origin has been suggested. The condition may be difficult of separation from enteric and malarial fevers and in its early stages, impossible unless by laboratory tests.

Prognosis. This varies with the type of the affection; the milder instances almost invariably recover under proper treatment. High temperatures suggest an unfavorable result although recovery has taken place when the temperature of the patient was 112° F. (44.4° C.). The complications are usually temporary excepting the insanities.

Treatment. Prevention of sun-stroke consists in the avoidance of extremes of heat, absolute abstinence from alcohol, over-eating and over-work; plenty of water should be taken, frequent baths are advisable and the clothing should be light.

In treating thermic fever the first indication is to lower the temperature as rapidly as possible. If a bath tub is available the patient should be immersed in cool water and rubbed vigorously with lumps of ice in the hands of at least two attendants. If no tub is at hand the patient should be placed in the shade, if in the open air, and cool water should be dashed upon him. If tubbing is impossible for other reasons, ice water enemata or the ice pack may be substituted for this procedure; sprinkle baths from a watering can

held at a considerable height or from a hose are often beneficial, probably from the stimulation effected by the impact of the water against the body as well as from the reduction of temperature which results. The temperature should be taken at frequent intervals and when it has reached 102° F. (38.9° C.) the hydropathic measures should be stopped, for otherwise the temperature is likely to fall to a subnormal level and collapse may result. The patient should now be put to bed, given a cathartic and catheterized if necessary; he should remain in bed and on a light diet for a few days. Subsequent rises of temperature may be controlled by cold sponging or tub baths if necessary; the coal tar antipyretics may also be employed.

Syncope may be controlled by hypodermatic injections of brandy or whiskey; ether, ammonia and strychnine may also be employed. Artificial respiration is sometimes necessary.

In the rapidly fatal instances with symptoms of asphyxia, venesection should be performed. Convulsions should be controlled by chloroform inhalations.

The treatment of the consequences of thermic fever is symptomatic. For many years after recovery it may be impossible for the patient to live in a locality where even moderately high temperatures are likely.

CHAPTER IV.

DISEASES OF THE DIGESTIVE SYSTEM AND PERITONÆUM.

DISEASES OF THE MOUTH AND TONGUE.

CATARRHAL STOMATITIS.

Definition. An acute inflammation of the buccal mucous membrane.

Ætiology. The causes are usually mechanical, neglect of the toilet of the mouth or secondary to or associated with some infection.

Symptoms. There is redness, heat, dryness, and swelling of the oral mucous membrane with minute vesicles in the inside of the cheeks; the saliva may be acid.

Varieties. The simple has already been described. Aphthous stomatitis shows generally several vesicles upon the edge of the tongue, cheek or inner surface of the lips, these rupturing leave small ulcers presenting a yellow base surrounded with a red border. Marasmic stomatitis (Bednar's disease) afflicts babies suffering from marasmus and shows large white patches on the posterior half of the hard palate which may ulcerate and involve the bone and result fatally. Membranous or croupous stomatitis offers a more extended inflammation which is attended with a false membrane.

Diagnosis. This is based upon the appearances above described.

Prognosis. This is generally good as to life.

Treatment. This is fully described under mycotic stomatitis.

MYCOTIC STOMATITIS.

Synonyms. Thrush; Parasitic Stomatitis; Sprue.

Definition. A specific, contagious inflammation of the buccal and pharyngeal mucous membranes characterized by whitish deposits.

Ætiology. The inflammation is due to the growth and development upon the lining of the mouth and pharynx of a fungus, the *oidium albicans* or the *saccharomyces*. Thrush occurs chiefly in nursing children and is especially predisposed to by poor physical conditions, unhealthy surroundings and the use of unclean nipples and nursing bottles.

Pathology. The *oidium albicans* grows upon the mucous membrane in the form of numerous scattered tiny grayish-white spots. These may coalesce and form areas covering, in rare instances, almost the entire buccal lining and involving the œsophagus. Around these whitish spots is a reddened areola and they are somewhat adherent to the mucous membrane but may be detached, leaving a surface intact or eroded.

Symptoms. These consist of the presence of the already described spots and of those of the accompanying physical condition. The mouth is likely to be dry and should there be any doubt about the diagnosis it can readily be assured by recourse to the microscope.

Treatment. Infants in almost all instances may be prevented from acquiring stomatitis by proper attention to the cleanliness of rubber nipples, nursing bottles, etc. The nipple should be boiled daily in a solution of washing soda and should be kept in a boric acid or salicylic acid solution. The child's mouth should be cleansed by means of the finger wrapped about with a bit of absorbent cotton moistened with boric acid solution or a solution of sodium bicarbonate. Such methods should prevent the occurrence of sprue. When the disease is present the above means should be employed and in addition the lining of the mouth should be gently painted three or four times a day with a camel's hair brush dipped in an one to three percent. solution of silver nitrate, or a five percent. solution of alum. In obstinate instances it may be well to give the mouth a few days' complete rest and feed through the nasal tube, at the same time employing local treatment as above.

The various forms of stomatitis in adults, including the mercurial variety, should be treated by strict attention to the hygiene of the mouth; the abuse of alcohol and tobacco should be stopped, the teeth should be frequently brushed and otherwise properly cared for. The frequent use of mildly antiseptic fluids such as liquor antisepticus, etc., is to be recommended. Tincture of myrrh is a pleasant mouth wash used in strength of two teaspoonsful (8.0) to the tumbler (250.0) of water and a saturated solution of potassium chlorate is also useful. The ulcers of aphthous stomatitis may be painted with three percent. silver nitrate solution or gently touched with the silver nitrate pencil.

In the treatment of the various forms of stomatitis the general bodily condition must not be neglected. Proper food, exercise, fresh air, etc., should be advised; tonics, such as iron, nux vomica, codliver oil and the like, may be necessary.

In mercurial stomatitis the administration of the mercury should be stopped and treatment, such as that described above, instituted. In addition atropine one one-hundredth of a grain (0.0006) may be employed once or twice daily to check the profuse salivation.

GANGRENOUS STOMATITIS.

Synonyms. Noma; Cancrum Oris.

Definition. An inflammation usually affecting the cheek at the angle of the mouth and spreading outward. It is characterized by infiltration, followed by necrosis and gangrene, of the tissues involved.

Ætiology. The disease is probably of microbic origin; it is usually seen in young children who have been brought up in unsanitary surroundings and are in poor physical condition. It is rarely primary but, as a rule, is secondary to attacks of measles, scarlatina or other acute infectious diseases.

Pathology. The process consists first of a brawny infiltration of the tissues, followed by a slowly spreading gangrene which may go on to perforation of the cheek or involvement of the jaw. Rarely does the gangrenous tissue separate spontaneously, the process usually advancing until terminated by death.

Symptoms. The first local manifestation is a dark spot upon the lip or cheek, but usually the condition is well advanced before the diagnosis is made. There is a characteristically foul breath and the odor of the sloughing surface is very foetid; as the disease advances the eye or ear may become involved and the neighboring lymph ganglia are enlarged. The pain of noma is usually slight.

When the disease is well established in its course the temperature is typical of sepsis, the pulse rapid and weak, and the appearance one of great prostration. There may be gastro-intestinal disturbances, as colitis, due to the swallowing of the discharge from the inflammatory area, or septic pneumonia due to its inhalation. The course of the disease is rapid, lasting about a week or ten days. In female children gangrene of the genitals may supervene.

Prognosis. The mortality is high, seventy-five percent. of infections ending fatally.

Treatment. The prophylaxis of noma consists in the proper treatment of the ordinary forms of stomatitis and attention to the condition of the mouth during the course of all infectious diseases. The neglect of this latter is inexcusable, and too great stress cannot be laid upon the necessity for the frequent use of cleansing and antiseptic solutions upon the mouths and tongues of patients suffering from scarlatina, diphtheria, measles, and the other infections.

Children suffering from noma should be isolated and the treatment of the disease itself must, from the start, be most radical. Total excision of the inflammatory area with the knife, or cauterization by means of the Paquelin cautery are methods which have been in common use, and in a combination of the two we have the most efficacious means of treatment. The excision should be performed with the patient under a general anæsthetic and it should be extended well beyond the diseased area. After excision the cautery should be applied to the edges of the wound. The use of nitric acid or scraping away the diseased tissues is not to be recommended when the more radical procedure is possible. Plastic operations are often needed to correct the disfigurement caused by the disease.

The treatment, otherwise than by operation, consists in stimulation as indicated, keeping the sloughing surface and the mouth cleansed by means

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of antiseptic solutions, such as solution of hydrogen dioxide, potassium permanganate, etc., and instituting a nourishing diet.

The serum therapeusis of noma is as yet not upon sufficiently firm basis to be employed to the exclusion of surgical measures, although instances have been reported in which antidiphtheritic and antistreptococcus serum have been used with favorable results.

GEOGRAPHICAL TONGUE.

Synonyms. Pityriasis of the Tongue; Eczema of the Tongue.

Symptoms. This condition is evidenced by one or more grayish, slightly elevated spots upon the mucous membrane of the tongue. These areas may be of varying size and usually involve only the dorsum of the organ, they tend to spread peripherally, producing patches which may unite and, bounded as they are by a slightly elevated border, have given rise to the map-like appearance known as the "geographical tongue." The patches at times heal and disappear but seldom fail to recur from time to time. The symptoms are not marked, itching and burning sensations being, as a rule, all that causes the patient to complain. There may be an accompanying increase in the salivary secretion.

Treatment. The disease is not of malignant character although it is difficult of treatment. The general condition, and especially the digestion of the patient, should be looked to and proper diet and mode of life insisted upon. Tonics are useful in enfeebled conditions. Arsenic may be given and the use of astringent and antiseptic applications is indicated. Silver nitrate (three percent.), chromic acid (one percent.) and weak iodine solutions may be applied by means of a brush, and mouth washes of weak boric acid solution or tincture of myrrh may be employed. When this condition occurs in neurotic individuals, a course of the bromides followed by the glycerophosphates is important.

An ointment of boric acid and balsam of Peru in vaseline has been recommended, and Unna advises applications of sulphur, either in the form of a natural water containing this substance, or, preferably, in his opinion, washed sulphur in an emulsion.

LEUKOPLAKIA BUCCALIS.

Synonyms. Lingual Ichthyosis; Lingual Psoriasis; Smoker's Tongue; Chronic Superficial Glossitis.

Definition. A disease of the mucous membrane lining the mouth characterized by whitish patches of irregular size, which at times are thickened and tend to fissure.

Ætiology. The actual causation of this condition is not known; while it has been ascribed to syphilitic disease it has been known to occur in non-

lucetic individuals; the existence of mercurial stomatitis, excessive smoking, uncleanly buccal and dental conditions and gastro-intestinal diseases seem to be predisposing factors. Leukoplakia is most often seen in males beyond middle life, and is said to predispose to epithelioma.

Symptoms. The first indication of the disease is a hardly noticeable, reddish or bluish patch, which may be sensitive to hot or irritating foods. Very slowly and gradually the reddish spot develops into a rounded or irregular patch, whitish or pearly in color. Several of these, while small at their inception, may coalesce as they increase in size. The affected areas become thickened and stiff, have a hard surface and may become fissured. The dorsum of the tongue is most usually the site of the lesion but it may occur upon other parts of this organ, upon the lining of the cheeks or even upon the lips.

Treatment. This consists in establishing a cleanly condition of the mouth, stopping the use of tobacco, and proper care of the teeth. Antiseptic and astringent mouth washes are indicated and the patches should be touched with a ten percent. silver nitrate solution, or better with lunar caustic, once every ten days or so. The galvano-cautery has been used with benefit as also has a twenty percent. solution of pure chromic acid. A paste consisting of resorcinol four, zinc oxide one, benzoated lard to eight parts applied to the plaques will cause them to exfoliate and is recommended by certain dermatologists.

Syphilitic treatment accomplishes little in the treatment of buccal leukoplakia proper but when the diagnosis is in doubt the employment of mercury and the iodides is indicated. Treatment calculated to correct any accompanying digestive or assimilative disorder, which may be present, should benefit this condition.

RIGA'S DISEASE.

Definition. This is a benign excrescence upon the lingual frenum.

Ætiology. It occurs in children under two years of age, is probably caused by traumatism, and is not contagious. Pathologically it is a papilloma.

Symptoms. Nursing is interfered with. Rarely gastro-intestinal manifestations may be present.

Diagnosis.—It must be distinguished from the ulcer of whooping cough, chicken-pox, syphilis and herpes.

Treatment. If teeth irritate they must be removed. It may be necessary to wean the child. Caustics should be applied or the growth excised.

BAELZ'S DISEASE.

Synonym. Inflammation of the Labial Glands.

Definition. This is a chronic disease involving the mucous labial glands.

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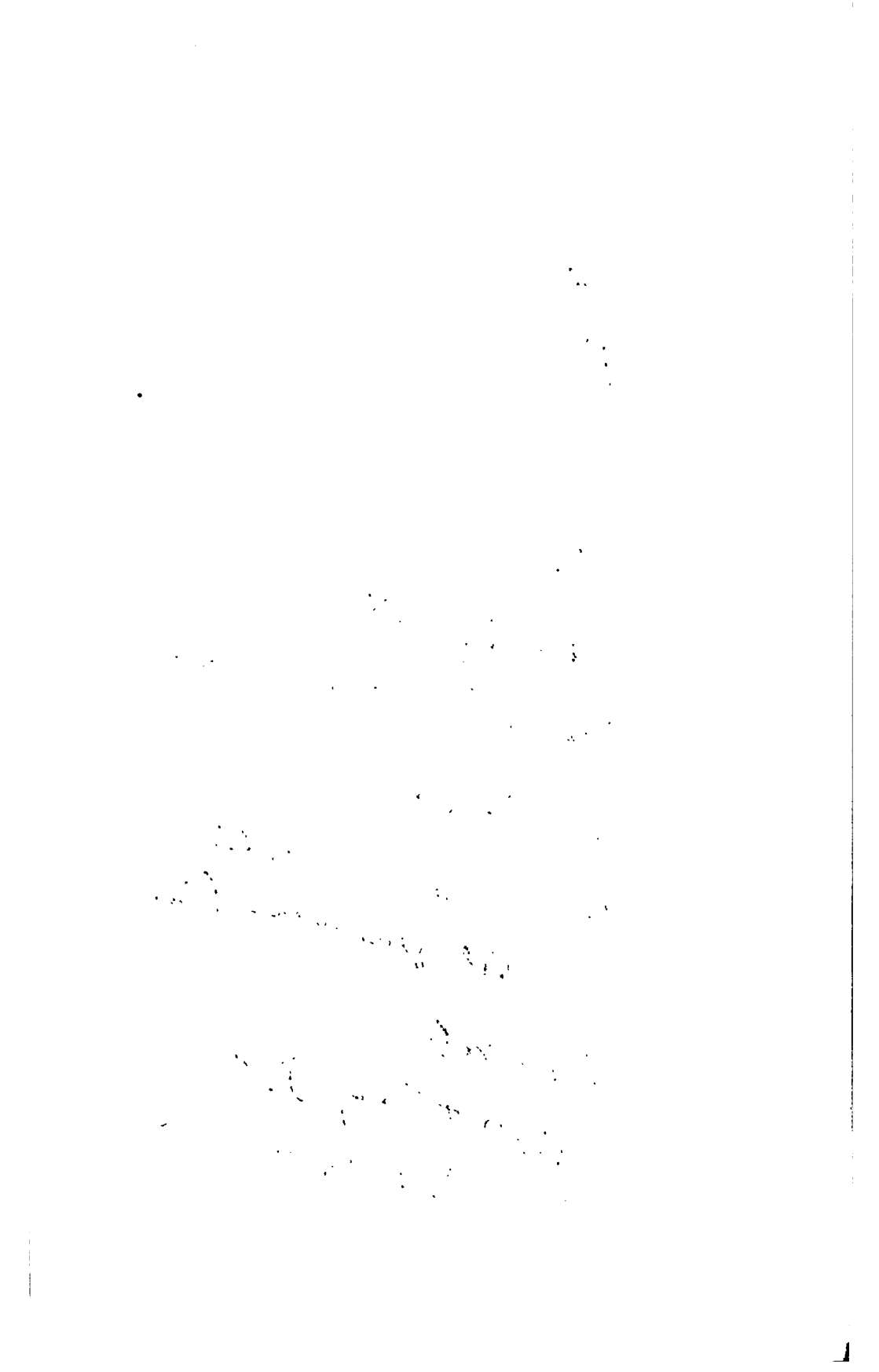
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Ætiology. It probably is caused by a specific infection but is not of syphilitic origin.

Pathology. Is is a sluggish swelling followed by ulceration, without producing constitutional symptoms or enlargement of the lymphatics.

Symptoms. There is pain on introduction of food or movement of the lips.

Diagnosis. This must be distinguished from the primary lesion of syphilis seated upon the lips which it resembles but unlike it does not affect the glands.

Treatment. The ulceration should be painted daily with dilute tincture of iodine.

DISEASES OF THE SALIVARY GLANDS.

PTYALISM.

Ptyalism or increased secretion of the saliva occurs as a symptom in poisoning by mercury, iodine, gold and copper. It may also be produced by jaborandi, muscarine, and tobacco. Excessive salivary secretion is often a symptom of various forms of stomatitis and in children may occur as a neurosis.

Treatment. This consists in the proper management of the ætiologic condition, if due to stomatitis, and in the stopping of whatever drug may be causative of the disturbance, together with measures calculated to remove whatever of the substance may be retained in the system. Such are the administration of saline purges if the salivation be due to mercury, or sodium bicarbonate if it be the result of iodism. Mouth washes, such as a saturated solution of potassium chlorate, are useful and atropine may be given with a view to the diminution of the activity of the salivary glands.

DRY MOUTH.

This condition, also called *xerostomia*, is usually seen in febrile conditions but may occur independently. It is met most frequently in hysterical women and may appear after nervous shock. It may be the effect of fever, mouth breathing, or of diabetes of either form. The symptoms are dryness of the mouth and a smooth, shining condition of its mucous membranes which are redder than normal in color.

Treatment. It is that of the nervous condition, as a result of which the *xerostomia* has appeared, and the use of mouth washes containing lemon juice. Small doses of potassium iodide or pilocarpine one-twentieth of a grain (0.003) may be given.

ACUTE PAROTITIS.

Infectious parotitis has been discussed in the section upon the infectious diseases (see p. 102).

Mikulicz's disease is a chronic enlargement of all of the salivary, as well as of the lachrymal and buccal glands. No cause can be found. It is usually chronic but in some instances the swelling may diminish.

Inflammation of the parotid gland, other than mumps, may occur as a complication of the acute infectious diseases (especially enteric fever), pneumonia, pyæmia and syphilitic disease; associated with diseases or injuries of the pelvic or abdominal viscera or genital organs; accompanying neuritis of the facial nerve and in poisoning by sulphuric acid. The inflammation is usually the result of microbic infection which may be transmitted through the blood current or directly through the duct of the gland. The parotitis accompanying facial neuritis is, in all probability, the result of some vasomotor abnormality. The symptoms of the condition are localized pain, tenderness, and swelling. The salivary secretion may be increased. Abscess formation may ensue with an accompanying temperature of septic type and increased pain and prostration.

Treatment. The synthetic analgesics, especially antipyrine salicylate (salipyrine) may be given to relieve the pain and tincture of aconite in five-drop (0.30) doses every two hours, may be administered unless the circulation is depressed by the causative infection. Chronic or subacute inflammations of the gland, which may occur as accompaniments of mercurial or lead poisoning, in syphilis, or following acute inflammations, should be treated by inunctions of mercurial ointment, ten percent. ichthyol in vaseline, compound iodine or iodine-vasogen ointment. An attempt to prevent abscess formation by means of leeches, the ice compress or coil should be made. As soon as abscess formation is evident an incision should be made and the pus evacuated.

LUDWIG'S ANGINA.

Synonyms. Angina Ludovici; Cellulitis of the Neck.

This condition is an inflammation of the floor of the mouth beginning in or about the submaxillary gland. It begins usually on one side, later spreading to the other, and is usually a complication of one of the acute infections (scarlatina, diphtheria); rarely it may be primary, starting from some insignificant lesion. It is a pyogenic infection and spreads through the tissues of the floor of the mouth and the throat. Sloughing of the soft parts or abscess formation may follow; in rare instances spontaneous resolution may take place.

Symptoms. These are pain, tenderness and swelling in the floor of the mouth, later in the neck, and dyspnœa if the larynx or trachea is pressed upon by the tumor. Œdema of the glottis may occur. The abscess may point

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either externally or internally and the constitutional symptoms, which are severe from the outset, are those of purulent infection in general. The prognosis is always serious, the mortality may be as high as forty percent. Supportive treatment must be prompt and vigorous. In addition the early application of leeches or cold may be applied in the form of compresses or the ice coil.

Surgical measures are likely to be sooner or later necessary and consist in free incision and evacuation of the pus.

VINCENT'S ANGINA.

Synonyms. Ulceromembranous Angina; Chancriform Angina; Diphtheroid Angina.

Definition. A form of sore throat caused by a spirillum and a fusiform bacillus as described by Vincent. Of the synonyms, the first describes its clinical course, the second its appearance and the third its resemblance to diphtheria.

Etiology. It occurs in children about the time of the second dentition and in adults at the eruption of the wisdom teeth. It occurs in people who do not attend to their mouths and who are addicted to tobacco and alcohol. It is mildly contagious. Its incubation period is about six days.

Varieties. It is recognized in two forms as: (a) ~~This~~, rarely met with, resembles the membrane of diphtheria, the exudate being almost a pure culture of the bacilli associated with other pyogenic organisms. The spirilla are absent. (b) ~~This~~ is a membranous ulceration containing both organisms.

Symptoms. There is slight fever, pharyngeal pain and some enlargement and tenderness of the submaxillary glands. In the second form the symptoms are more severe, difficulty in swallowing, pain in the limbs, headache, anorexia, vomiting, a temperature of 102.° F. (38.8° C.), and albuminuria. The breath is likely to be foul and salivation may be marked. One or both tonsils may be involved; it may spread to the soft palate, uvula, and involve the whole oral cavity in a general membranous stomatitis. The destruction of tissues may be so great that it may endanger life.

Prognosis. Generally favorable excepting when it goes on to severe ulceration. The process lasts from a few days to three months.

Treatment. The membrane or the ulceration may be painted with tincture of iodine, which is very painful, twice daily. Swain obtains excellent results from the use of a ten percent. solution of zinc chloride used once or twice daily, the area of application having been previously thoroughly cleansed with the solution of hydrogen dioxide. Chromic acid as well as methylene blue have been used locally. Arrowsmith has found that painting the ulcerations with a ten percent. solution of trichloroacetic acid was grateful

to the patient and acted favorably. Easily swallowed food, strongly supporting treatment, and a change of air are necessary.

DISEASES OF THE TONSILS AND PHARYNX.

ACUTE CATARRHAL PHARYNGITIS.

Synonyms. Angina; Sore Throat.

Definition. A catarrhal inflammation of the mucous membrane lining the pharynx.

Ætiology. Certain persons appear to have a predisposition to frequent attacks of sore throat. The exciting cause is usually exposure to cold and dampness, although the condition may be caused by the inhalation of irritating dust or vapors. The inflammation often occurs in individuals of gouty or rheumatic tendency, and is frequently associated with acute inflammations of the nasal mucous membrane and tonsils.

Pathology. As in all acute inflammations of mucous membranes, the pharyngeal mucous membrane and the uvula are at first dry, congested and swollen; after a number of hours or a day or two there is an excessive secretion of mucus which may be either thin and watery or thick and viscid.

Symptoms. There is usually a considerable rise in temperature, preceded by chilly feelings and general pains; the local symptoms consist first of a dryness of the throat, with discomfort or actual pain on swallowing. If the inflammation involves the larynx or Eustachian tubes there will be hoarseness and slight cough, or fullness in the head and varying degrees of impairment of the hearing. On examination the throat is seen to be red and swollen; or covered by the excess of mucous secretion. Accompanying the inflammation various tonsillar conditions may be observed.

Treatment. If seen early the patient should be given a Dover's powder, his bowels should be freely opened by repeated small doses of calomel (one-fourth to one-half a grain)—(0.016 to 0.03) followed by a saline and he should be put to bed. The general bodily pain may be relieved by antipyrine salicylate (salipyrine) in doses of ten grains (0.65) every two hours until efficacious. This drug will have in addition an antipyretic effect and the fact that it contains the salicyl-radical makes it especially advantageous in rheumatic patients. Phenyl salicylate in doses of five to ten grains (0.30 to 0.65) every four hours and salicin are also useful in this connection.

Aconite is of use in controlling the fever and also benefits the local condition. The tincture may be given in four minim (0.25) doses every hour or two or one four-hundredth of a grain (0.00016) of aconitine may be administered every four hours. These drugs should be stopped as soon as their physiological effect is evident, as manifested by numbness and tingling of the fauces.

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The pain in the throat may be lessened by the application of frequently changed hot or cold compresses, flax seed poultices or, in severe instances, by a mild mustard paste. The pharyngeal discomfort and the local inflammation are amenable to treatment by various means such as tablets to be dissolved in the mouth, gargles, direct applications and soothing sprays. \mathcal{R} , potassii chloratis, gra. xv (1.0), olei menthæ piperitæ, \mathfrak{m} iii (0.20), extracti kramerizæ, gra. xv (1.0), extracti glycyrrhizæ, \mathfrak{z} iss (6.0); fiat massa et div. in trochiscos no. xxx. \mathcal{R} , codeinæ, gra. iii (0.20), extracti gambir, gra. xx (1.30), extracti glycyrrhizæ, \mathfrak{z} iss (6.0); fiat massa et div. in trochiscos no. xx. \mathcal{R} , cocainæ hydrochloridi, gr. $\frac{3}{16}$ (0.002), antipyrinæ, gra. ii (0.12), sacchari lactis et aquæ destillatæ q. s., fiat tales trochiscos no. xx. \mathcal{R} , ammonii hydrochloridi, gra. xx (1.30), pulveris ipecacuanhæ, gr. i (0.065), pulveris capsici, gr. $\frac{1}{4}$ (0.015), extracti glycyrrhizæ, \mathfrak{z} ii (8.0); fiat massa et div. in trochiscos no. xx. Of any of the foregoing tablets one may be dissolved in the mouth every two hours. The first formula is indicated in moderate pharyngeal inflammations, the second and third, when pain and irritating cough are present and the fourth, when the pharynx is covered with thick and tenacious secretion.

Small pieces of cracked ice held and allowed to dissolve in the mouth are agreeable when the pharynx is dry and painful.

Gargles are unsatisfactory as it is very difficult to reach with them the site of the inflammation but they may be used by patients to whom the atomizer spray is disagreeable. Various sprays may be prescribed. The following will be found useful; potassium chlorate five grains (0.30); alum five grains (0.30); tannic acid five grains (0.30) or tincture of iron chloride, ten drops (0.65) to the ounce (30.0) of water.

Direct applications by means of a camel's hair brush of (a) equal parts of glycerin and tincture of iron chloride, (b) glycerite of tannic acid, one to four of water, or (c) silver nitrate in two percent. solution may be employed.

In the severe instances quick relief will usually follow the use of astringent sprays of which any of the following is applicable; zinc chloride or zinc sulphate four percent. solution in liquor antisepticus; iron and ammonium sulphate, one, glycerite of tannic acid six; or silver nitrate one part to forty-eight parts of water. These may be sprayed into the throat by means of an ordinary atomizer, first having cleansed the parts of mucus by means of an alkaline solution such as dilute liquor antisepticus, every hour or two during the acute stage of the inflammation, the intervals being lengthened as recovery progresses.

Sprays of oily solutions such as oil of santal one part or eucalyptol two parts to one hundred parts of liquid albolene are often soothing to the dry and irritable throat.

An important adjunct to the management of acute pharyngitis is the proper treatment of accompanying nasal, tonsillar, or laryngeal inflammations

CHRONIC CATARRHAL PHARYNGITIS.

Synonyms. Clergyman's Sore Throat; Granular Pharyngitis.

Definition. This is a hyperæmia with the addition of a granular appearance due to enlargement of the minute lymphatic glands.

Ætiology. Repeated attacks of the acute form, use of tobacco, alcohol, abuse of the voice as by clergymen, public speakers and singers, hucksters, etc.

Varieties. This may be a simple chronic angina, or follicular pharyngitis, or a more severe form leading to ulceration as in syphilis and other infections, or if suppuration takes place it is termed phlegmonous.

Symptoms. Pain on swallowing or talking, fever and in the more severe forms exhaustion.

Diagnosis. This is easily determined by inspection. From the phlegmonous form, retropharyngeal abscess which may be subperiosteal from caries of the vertebræ or arising from postpharyngeal lymphatic glands, should be carefully distinguished.

Treatment. The causes should be removed and the associated diseases treated. Local applications are useful as in the acute form. The granules may be destroyed with the white-hot platinum wire,

ACUTE FOLLICULAR TONSILLITIS.

Synonyms. Acute Lacunar Tonsillitis; Angina Follicularis; Ulcerative Tonsillitis.

Definition. An acute exudative inflammation characterized by the appearance of whitish-yellow spots upon tonsils.

Ætiology. The direct cause of this condition is doubtless a microbic infection probably due to one of the common pyogenic bacteria. It is prone to attack the enlarged tonsil, and the exciting cause is usually undue exposure. Some persons seem predisposed to this disease. It is frequently seen in children.

Pathology. The tonsils are red, congested and swollen; their crypts are filled with plugs consisting of mucus, pus, epithelium, and bacteria. There is no true ulceration but occasionally one or more of the tonsillar crypts becomes the seat of a small abscess.

Symptoms. These resemble so closely those of a severe acute pharyngitis that they hardly need separate description. The prostration is apt to be marked and, especially in children, unless the throat is carefully examined, the condition is likely to be mistaken for some more serious condition. Examination of the throat reveals swollen, red, and congested tonsils, not only the faucial but the third tonsil as well, and pharynx and the presence upon the former of the characteristic spots. The differential diagnosis from true diphtheria is often impossible without laboratory examination. General bodily pains and a febrile movement are, as a rule, present.

Treatment. When spots are seen upon the tonsils of children it is often wise to give diphtheria antitoxin in therapeutic dosage without waiting for a bacterial examination of the exudate, otherwise valuable time may be lost. The constitutional treatment of the condition otherwise is practically that of an acute pharyngitis.

The application to the outside of the throat of the local measures described under acute catarrhal pharyngitis is also in order.

With regard to local applications the use of an antiseptic spray of Dobell's solution or of liquor antisepticus and water is excellent; in addition the tonsils should be painted with some astringent or antiseptic such as Monsell's solution, tincture of iron chloride, tincture of iodine, or one to one thousand mercury bichloride solution.

As an adjunct to the above treatment one to two drachms (4.0 to 8.0) each (for an adult) of tincture of iron chloride and glycerin should be slowly swallowed every hour or two so that the mixture may come into contact with the diseased surface and the patient may dissolve in his mouth every three or four hours a pastile containing one-thirtieth of a grain (0.002) of thymol, one-third of a grain (0.02) of sodium benzoate and one-eighth of a grain (0.008) of saccharin. One of these is kept in the mouth until it has lost its taste. It is then removed, since by this time the saliva has become so impregnated with the medicaments which it contains that in swallowing, these come in contact with the seat of the inflammation.

When adenoids and hypertrophy of the tonsils exist the removal of these as a prophylactic measure is strongly to be advised. It is needless to say that the operation should not be done during the height of the inflammation.

Important also is attention to the general condition of patients disposed to tonsillar inflammations. Proper hygiene, diet and tonic treatment are indicated. The exhibition of codliver oil and the syrup of iron iodide is especially to be commended in this connection.

QUINSY SORE THROAT.

Synonyms. Peritonsillar Abscess; Phlegmonous Tonsillitis; Acute Parenchymatous Tonsillitis.

Definition. An acute suppurative inflammation of the tonsillar or peritonsillar tissue.

Ætiology. The causes of this condition are practically identical with those of acute follicular tonsillitis. It is seldom seen in children or persons beyond middle life. Its actual cause is pyogenic germ infection but attacks are often excited by exposure, and it is frequent in individuals possessing hypertrophied tonsils.

Pathology. One or both tonsils may be affected; they become swollen, red, painful and tender and, if pus formation occurs, the induration gradually

becomes less marked and an abscess supervenes which, unless opened, may rupture and discharge its contents. The lymph glands of the neck are often enlarged and tender.

Symptoms. The disease is usually ushered in by a chill followed by a marked rise in temperature, general pains and prostration. There is pain in the throat, increased by swallowing and by opening the mouth. There is tenderness over the angle of the jaw and in the neck. The voice becomes nasal, the secretion of saliva is increased and the pain caused by swallowing may result in dribbling from the mouth. Bad odor of the breath and of the saliva is not infrequent. The swelling of the pharynx may cause difficulty in breathing; the pulse is rapid and bounding and the temperature curve is likely to be of septic type. These symptoms last several days until the abscess forms and bursts or is relieved by incision. Under proper treatment the prognosis is good. Frequent palpation of the seat of the inflammation should be made to determine the presence of pus.

Treatment. Prophylaxis consists in the removal of hypertrophied tonsils and attention to nasal or pharyngeal conditions. If there is any rheumatic tendency it should be combated by the administration of the salicylates. At the beginning of the attack the patient should be put to bed and his bowels freely opened by means of repeated small doses of calomel followed by a saline. The diet should be of fluids. If seen early, an attempt to abort may be made by means of the administration of ten grains (0.65) of sodium salicylate every hour until physiological effect has become apparent, tincture of aconite five drops (0.30) every hour until four doses have been taken and a single dose of ten grains (0.65) of quinine with one (0.065) of opium. These measures may succeed if instituted early in the inflammation.

The pain and discomfort may be mitigated by the local application of five percent. cocaine solution, by frequent application by means of the finger to the tonsil of sodium bicarbonate, and by the external use of cataplasma kaolini, hot water bags or hot compresses. Gargling the throat with as hot water as can be borne, the use of alkaline and antiseptic sprays and inhalations of steam may also relieve the patient's discomfort. Local blood-letting by means of punctures (never scarification) with a slender sharp pointed knife will relieve the tension and reduce the inflammation.

The tonsils and the peritonsillar regions, especially the posterior, as well, should be frequently felt by the physician and as soon as fluctuation is manifest the abscess cavity should be freely incised in the *vertical* direction over the point of maximum fluctuation and the pus evacuated. After incision the use of antiseptic gargles and sprays should be continued until all inflammation has subsided.

In rare instances where the dyspnoea due to the swelling of the pharynx and consequent closure of its opening is extreme, tracheotomy may become necessary.

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CHRONIC TONSILLITIS.

Synonym. Chronic Nasopharyngeal Obstruction.

Definition. A chronic inflammatory condition of the tonsils or of the adenoid tissue of the pharynx or of the lingual tonsil.

Ætiology. Most commonly repeated attacks of tonsillitis, frequently the result of acute infectious diseases, and mostly found in children.

Pathology. It is a lymphoid growth in these structures which may encroach upon the passages.

Symptoms. The most important is obstructed breathing, resulting in mouth breathing, cough, disturbed rest, changed facial expression, real or apparent mental dulness, an emphysematous chest, nasal voice, impaired sense of taste and smell, deafness and generally malodorous breath. Sometimes habit chorea and stuttering are associated symptoms.

Diagnosis. This is easy after careful physical examination, not forgetting the tonsillar ring.

Prognosis. This is good if the diagnosis is an early one.

Treatment. This consists in regulating the entire life of the patient, using cleansing sprays as in the acute follicular disease and particularly in surgical removal, under anæsthesia, of all hypertrophied tissues.

DISEASES OF THE ŒSOPHAGUS.

ACUTE ŒSOPHAGITIS.

Definition. An acute inflammation of the œsophageal mucosa and sub-mucosa, rarely involving the muscular coats.

Ætiology. Acute œsophageal inflammation is usually the result of the swallowing of caustic or very hot liquids or of the presence of foreign bodies. The eruptions of the various exanthemata may involve the œsophageal mucous membrane and inflammations of the throat may spread downward to this structure.

Pathology. There is more or less redness of the œsophageal lining and there may be sloughing and destruction of tissue depending upon the cause of the lesion; hollow casts consisting of the entire lining of the organ have been expelled following the ingestion of corrosive acids or alkalies. As healing progresses the newly formed scar tissue may contract and produce stenoses of varying degree.

Symptoms. These vary with the degree of the inflammation. They consist of pain under the sternum which is increased upon deglutition, sometimes to such an extent as to render this process impossible. There may be profuse secretion of mucous, which may be either raised or swallowed, from the inflamed surface. Should the action of the cause of the lesion be suffi-

cient to erode the vessel walls there will be regurgitation of blood or this will appear in the stools. The resulting stenosis interferes with swallowing.

Treatment. This consists in putting the part as much at rest as possible. If the patient is able to swallow liquids only, these should be of the most soothing character, such as milk or arrowroot or other cereal gruels. The various demulcents or the swallowing of cracked ice afford relief to the pain.

When swallowing is impossible the patient must be fed by the rectum.

CHRONIC CATARRHAL ŒSOPHAGITIS.

This condition may exist as a complication of chronic endocarditis, cirrhosis of the liver or other affections which result in venous stasis. The œsophageal mucous membrane is the seat of a chronic catarrhal inflammation with hypersecretion of mucus. The veins of the part may become dilated and tortuous and may rupture with consequent regurgitation of blood, and sometimes a fatal ending. The enlarged veins are generally found in the lower fourth of the œsophagus. The amount of blood lost may be enormous. It is distinguished from vomited blood because it appears without nausea, the blood is bright red and is not acid, and no blood is passed by the bowel.

Treatment. This consists in the administration of forty grains (2.50) of calcium chloride and possibly transfusion of normal saline solution for the hæmorrhage, rectal feeding and drinking for ten days and later, in the proper management of the causative condition.

ŒSOPHAGEAL SPASM.

Synonym. Œsophagismus.

Ætiology. This affection is usually seen in persons of neurotic or hypochondriacal temperament of either sex. It may also occur in insanity, epilepsy, chorea and other nervous diseases.

Symptoms. The spasm is brought on by the attempt to swallow or by the thought of this act. There is no history of any condition which might have caused a stricture yet the patient complains of difficulty in swallowing and sometimes of painful deglutition. The condition does not get worse as it usually does in true stricture and there is equal difficulty in swallowing fluids and solids; in instances of long duration, above the seat of the spasm a dilatation may develop with a consequent catarrhal œsophagitis. There is usually loss of flesh and strength.

Treatment. This is usually efficacious and consists, in addition to the proper managing of the neurotic condition of the patient by means of sedatives, tonics, diet and regulation of the mode of life, in the passage of the stomach tube or œsophageal bougie. This should be done slowly and gently.

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~~Gastric Ulcer~~
^ (see page 3 ~~82~~ 82)

The instrument should be passed into the œsophagus until it reaches the seat of the spasm. Here it should be held and upon it very gentle pressure should be exerted; suddenly the spasm will give way and the bougie or tube will pass through. This should be done once or twice a day. In conjunction with the passage of the tube it is often well to wash out the stomach and introduce fluid food.

ULCER OF THE ŒSOPHAGUS.

Definition. An ulcer, generally in the lower third of the œsophagus, due to direct action of the gastric juice.

Ætiology. It is more frequent in men of middle age, and associated with insufficiency of gastric cardia.

Symptoms. Pain, difficulty of swallowing, vomiting, sometimes of blood. Perforation is not infrequent.

Diagnosis. Pain on deglutition is more marked than in ulcer of the stomach and vomiting is not preceded by nausea. Stenosis may result, and other causes of stenosis, as aneurysm, must be excluded by showing the non-existence of these.

Prognosis. This is unfavorable as regards cure.

Treatment. The same as for gastric ulcer to which reference should be made. Rectal feeding is generally necessary. The stenosis may require an operation in a chamber of differential air pressure.

CANCER OF THE ŒSOPHAGUS.

Pathology. Cancer of the œsophagus is usually of the epithelial type beginning in the wall of the organ and gradually surrounding it; the growth develops in hard masses which may or may not ulcerate, and usually causes a stenosis, above which dilatation is likely to take place. The cancerous process may involve any portion of the tube but is slightly more frequent in its lower portion. It may extend to the adjoining structures and metastases may be set up in the various viscera; œsophageal cancer is rarely seen before middle life.

Symptoms. The first of these to attract notice is dysphagia; at first it occurs with solid food only, later liquids are swallowed with difficulty and finally complete œsophageal obstruction may develop. The difficulty in swallowing is accompanied by the regurgitation of food. There is often pain referred to the œsophageal or sternal region; this is especially marked when the patient swallows and may be present when the œsophagus is at rest. As the disease progresses the typical cancerous cachexia appears and its advancement may be rapid because of the difficulty of getting sufficient food into the patient's stomach. Examination by the œsophageal bougie, which

should be made with the greatest gentleness, reveals the presence of an obstruction and may cause slight hæmorrhage.

Treatment. This consists in the employment of means to prolong the patient's life. He should be fed by the mouth as long as he is able to swallow and afterward rectal feeding must be employed. The obstruction may be retarded in its tendency to cause stenosis by the gentle passage of a stomach tube from time to time. Gastrostomy may be performed and the patient's life prolonged by making a permanent gastric fistula through which he may be fed. Other surgical measures are removal either wholly or relief of stenosis, by operations carried on in a chamber under differential air pressure. Inasmuch as œsophageal cancer is comparatively frequent, often primary in this locality, is of slow growth and late in producing metastases, an early diagnosis is likely to give brilliant therapeutic results. The use of radium has been exploited and is worthy of trial. The metal may be enclosed in a tube attached to a flexible bougie and exposure made by passing the same to the site of the lesion.

STRICTURE OF THE ŒSOPHAGUS.

Ætiology. The benign condition is rarely congenital; more frequently it is acquired. Its most usual cause is cicatricial contraction following ulcers which may have resulted from the ingestion of escharotic substances or from syphilis. The œsophagus may also be narrowed as a result of pressure of tumors extraneous to it, such as enlarged mediastinal glands or new growths, aneurysms, etc., and as a result of tumors having their origin in its wall.

Symptoms. The symptoms of non-malignant stricture of the œsophagus are those of stenosis, difficulty in swallowing of greater or less degree, and regurgitation. Pain is sometimes present. Above the stricture there is usually dilatation.

Treatment. This consists in the gradual dilation of the stricture by means of bougies. If cancer is possible this must be done with great care. The situation of the lesion should be determined by the passage of one of these instruments and then, by using sizes successively smaller, the calibre of the opening is ascertained. When this has been done the stricture is dilated by passing as large an instrument as is possible without causing too much pain. At successive sittings the bougies used may be of larger and larger sizes. Certain strictures may be of such small diameter that no bougie can be passed, in which case rectal feeding must be prescribed and surgical procedures are necessary. These consist of the making of a permanent gastric fistula through which the patient may be fed, or the performance of various operations upon either the œsophagus itself which can be done under differ-



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ential air pressure or upon the extraneous lesions which by their pressure cause the obstruction.

DILATATION OF THE ŒSOPHAGUS.

This may be either fusiform, involving the whole circumference of the organ, or sacculated, involving only a portion of its periphery.

The former variety is usually secondary to strictures although rarely it may occur idiopathically. It may involve the whole length of the tube or only a portion. Its diameter is frequently greatest at its lowest part; the wall of the tube is thickened and at times its muscular coat is paralyzed.

Sacculated dilatations or diverticula are of two varieties, (1) those due to contraction of some tissue which as a result of inflammation has become adherent to the œsophagus; these are more frequent in children, are usually small and may be multiple. (2) The second variety is usually seen in adults, is found in the upper part of the tube where its wall is weakest and is due to pressure, exerted by boluses of food, which are too large, or to traumatism, such as the lodgment of a bone. Such diverticula involve the posterior wall.

Symptoms. Those of the fusiform dilatations are dysphagia, regurgitation of food and at times vomiting. The patient may complain that, though a considerable quantity of food is eaten, there is a sensation as if very little reached the stomach.

The diverticula due to contraction are usually without symptoms but those due to pressure cause difficulty in swallowing and, as the sacs become larger and catch the food swallowed, this is regurgitated. At times there is a foul odor of the breath due to the putrefaction of food retained in the sac. This form of dilatation tends to increase in size and, as the enlargement progresses, it may press upon the œsophagus and cause occlusion. As the difficulty in getting food into the patient's stomach increases he loses flesh and strength and may finally die from starvation. The diagnosis of the condition is made by the use of the bougie and it must be carefully differentiated from stricture without dilatation. This may be done by passing ~~one~~ stomach tube into the sac and emptying it of its contents, leaving this *in situ*, and then a bougie into the stomach. At times it may be difficult to pass a stomach tube into the diverticulum, but this may be more readily accomplished by the use of a specially constructed instrument slightly bent at its end. The size and location of the diverticulum can be ascertained by filling it with bismuth paste and making a Röntgen-ray photograph of it.

Treatment. This consists in the dilatation of the stricture, if it is present, and by feeding through the stomach tube. Rectal feeding may be found useful as an adjunct to other means. Surgical measures, such as the formation of a permanent gastric fistula, the relief of the causative stenosis by various operative procedures or the removal of the diverticula, may be employed as indicated.

DISEASES OF THE STOMACH.

ACUTE CATARRHAL GASTRITIS.

Synonyms. Acute Gastric Catarrh; Gastric Fever; Acute Dyspepsia.

Definition. An acute catarrhal inflammation of the mucous membrane lining the stomach due to simple irritation or occurring as a result of the presence of the products of decomposing or fermenting food.

Ætiology. The disease may follow interference with the hepatic function, it may be caused by exposure or it may complicate any of the acute infectious diseases. The most usual causes, however, are over-loading the stomach with indigestible or highly seasoned foods or the excessive drinking of alcoholic beverages.

Pathology. The gastric mucous membrane becomes first congested and swollen and its secretions are diminished. Later the mucous secretion is increased in quantity and there may be an exudation of serum and emigration of white blood cells. More rarely there may be small hæmorrhagic spots or hæmorrhagic erosions of the gastric lining.

Symptoms. The principal symptoms are lack of appetite, nausea, usually followed by vomiting, which may bring relief to the patient, bad taste in the mouth, headache, dizziness and general physical and mental depression. Pain of greater or less degree may be present.

The lips and mouth are dry, the tongue is coated and palpation of the stomach may reveal indistinctly localized tenderness and distention of the organ involved. There are eructations of gas and of acid or bitter matter. The vomiting may be frequent and the patient sometimes is unable to keep anything in the stomach. The bowels are usually constipated, though diarrhoea is at times observed. The skin and conjunctivæ may be jaundiced as a result of an accompanying duodenitis. There may be a moderate febrile movement, but elevation of temperature is not a feature of this disease. With the fever the pulse is accelerated. The urine is scanty and highly colored and usually contains urates in excess. Indicanuria is not infrequent. An attack of acute gastritis usually lasts from two to four days.

The stomach contents, either the matter vomited or the result of a test-meal, shows an abnormal increase in mucus, a diminution in the total acidity and a lack of free hydrochloric acid. Lactic, butyric, acetic acids and bile are often present. The food is only partially digested and frequently appears to have been little changed since it left the mouth.

Treatment. In persons susceptible to attacks of acute gastritis much may be done in the way of prevention by the wearing of proper clothing. Constriction of the region of the stomach by improperly fitting or too tightly laced corsets and especially the suspension of garments from the waist often predisposes to gastric attacks in women and consequently these practices

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should be inveighed against. Chilling of the abdomen is likely to bring on an attack, and to provide against this, snugly fitting garments, sufficiently warm in texture and preferably not open below, should be worn. The abdominal binder either knitted or made of flannel is recommended.

Dietetic prophylaxis consists in the avoidance of indigestible or highly seasoned foods and especially those which may be adulterated with chemical substances. The practice of food-adulteration is becoming all too common; coloring matters and preservatives are frequently introduced and these substances are prone to disturb the susceptible stomach. Not only must the quality of the ingested food be supervised but care should be exercised against over-loading the stomach, the teeth must be kept in good condition and the patient advised concerning proper mastication and insalivation.

The treatment of the attack proper consists in insuring as complete rest as possible for the organ involved, consequently it is wise to give as little food and drink as possible until the gastric irritability has disappeared. There is no reason why the patient suffering from acute gastritis should not fast for a day or more, even though there is a sustained prejudice amongst the laity against the practice. When excessive thirst is present the mouth may be rinsed with cool water, which should not be swallowed, or cracked ice may be sucked. A little dry champagne, a weak solution of hydrochloric acid, carbonated waters, or cold tea without sugar may be employed in checking thirst, but it is important that very little fluid of any sort should be taken at a time.

After the day's fast the first food to be allowed is milk; this may be diluted with a little lime water or an equal quantity of Vichy, peptonized or boiled, and but a small quantity should be given at a time. Beef or chicken broth containing egg or rice may follow and on the third day zweiback or soda biscuit may be given. By the fourth day the tolerance of the stomach and the patient's hunger will have so increased that a return to a more general diet will be necessary and such foods as broiled chicken, not the cold-storage variety, or squab, broiled sweetbreads and veal boiled in bouillon may be given; potato purée soup, scraped beef, scraped ham, stewed tripe, fruit, tapioca, rice and eggs, soft boiled, scrambled or as omelet may be added by the sixth day.

On the second day of the attack it is wise to administer calomel either in six, one-quarter grain (0.016) doses, one every half hour, or better in two large doses of five grains (0.30) one at night, the other in the morning. By this means any irritating substance which may have gotten beyond the pylorus will be prevented from doing further harm and any accompanying constipation will be relieved. The frequent vomiting of the first day will usually interfere with any medication by mouth, even were it necessary. This vomiting as a rule empties the stomach effectually, but should this not be the case and should the emesis persist beyond the endurance of the patient,

gastric lavage with warm water by means of the stomach tube should be employed. In children it is particularly beneficial. Here a soft rubber catheter of appropriate size must be used and, while its eye may be too small to allow the admission of the larger food particles, its introduction may induce vomiting and the wash water poured through it will cleanse the stomach. During the lavage the patient should be directed to change his position, standing erect, then lying on the back and each of his sides in succession. Changes of position are easily made in the case of children but in the adult unaccustomed to the tube it will be found more difficult. The object of assuming different postures is to permit the lavage to cleanse every portion of the stomach. A drachm (4.0) of sodium bicarbonate added to each quart (litre) of the water used will assist in dissolving the mucus from the gastric lining. When the water returns clear a final washing with a disinfectant solution of thymol eight grains (0.5), boric acid one-half of an ounce (15.0) to the quart (litre) of water is advisable. As a substitute for washing the stomach copious draughts of warm water may be taken and emesis induced by applying the finger to the pharynx. The use of emetic drugs is considered inadvisable by most gastrologists because of the depression and increased gastric irritation which they produce. However, one may, if necessary, give a drachm (4.0) of syrup of ipecac to a child; in the adult the hypodermatic use of apomorphine hydrochloride one-twelfth of a grain (0.005) is to be preferred to ipecac or antimony.

A few hours after the stomach has been cleansed the high colonic irrigation consisting of a gallon (4 litres) of warm—105°–110° F. (40.5–43.3° C.)—half-saturated boric acid solution should be given in order to remove any irritating substance which may be present; in asthenic patients this procedure acts also as a stimulant of considerable value.

Very persistent vomiting is extremely exhausting to the patient and when not relieved by emptying the stomach by lavage, may be controlled by bismuth subcarbonate and minute quantities of cocaine in combination.

In rare instances weakness and tendency to collapse occur and may be combated by small doses, one-half to one drachm (2.0 to 4.0), of iced champagne or brandy and cracked ice repeated as indicated.

Pain or feeling of oppression in the abdomen may be relieved by hot or cold applications or turpentine stupes. When fever is present the cold are to be preferred; if the patient is chilly the hot are indicated.

The use of morphine hypodermatically for the pain is not to be recommended except under exceptional circumstances. In all ordinary instances this symptom may be controlled by codeine by mouth or combined with belladonna in suppositories containing each a quarter of a grain (0.016) of codeine and an equal quantity of extract of belladonna. One of these may be used every two or three hours until the pain is eased.

Codeine by mouth may be given in tablet form or in solution. Quarter

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to half grain (0.016 to 0.03) doses may be taken every three hours. The sulphate may also be administered hypodermatically with good effect.

Following an attack of acute gastritis the appetite may be poor; in such a contingency the bitter tonics, condurango, rhubarb, etc., may be given, either alone or with dilute hydrochloric acid, to supply the lack of this substance in the stomach. Ten drops of the dilute acid (0.65) may be given in a glass of water before or during meals. The following prescription is also useful in this connection and when there is need of a general tonic. \mathcal{R} strychninæ sulphatis, gr. ss (0.03), acidi hydrochlorici diluti, \mathfrak{I} ss (15.0), fluidextracti condurango, \mathfrak{I} vi (25.0), syrupi aurantii corticis q. s. ad \mathfrak{I} iv (120.0). *Misce et signa.* One teaspoonful in a wine glass of water one-half hour before each meal. It should be remembered that mixtures containing hydrochloric acid should be taken through a tube in order to prevent corrosion of the teeth.

CHRONIC CATARRHAL GASTRITIS.

Synonyms. Chronic Gastric Catarrh; Chronic Catarrhal Dyspepsia.

Definition. A chronic catarrhal inflammation of the mucous membrane of the stomach usually associated with the hypersecretion of mucus and abnormalities of the digestive elements of the gastric secretions.

Ætiology. This condition may result from repeated attacks of acute gastritis or the complicating gastritis of the infectious diseases. It follows the continued ingestion of too much or improper food or the abuse of medicines, tobacco and alcoholic drinks. Conditions which interfere with the proper blood supply of the organ, such as chronic endocarditis, cirrhosis of the liver, chronic pulmonary disease and chronic nephritis, often produce this affection.

Pathology. The mucous lining of the stomach is swollen and congested, it is grayish or brownish in color, may be ridged and usually is covered with a viscid alkaline mucus. The peptic glands are first increased in size, finally degenerate and become atrophic. The supporting connective tissue stroma may be in a state of hyperplasia. In marked instances the glands may be obliterated by this over-growth of tissue. These changes may involve the entire gastric mucosa or a limited portion of this structure.

Symptoms. Pain is a frequent symptom and varies from a sense of discomfort or fulness referred to the stomach to marked distress. Tenderness may be present; it is, as a rule, diffuse. The appetite is diminished or lost and even the thought of food may disgust the patient. There is an unpleasant taste in the mouth, a coated tongue, nausea and oftentimes vomiting. The vomitus consists of mucus and undigested food with, rarely, a little blood. Its reaction may be acid or not; when the former is the case the acidity is not due to the presence of the normal hydrochloric acid of the stomach but to that of lactic, butyric and acetic acids, resulting from the

fermentation of the undigested food. The eructation of gas is a frequent symptom. In the alcoholic type of the disease early morning vomiting of mucus—the so-called water brash—is frequent. The bowels are likely to be constipated.

The urine is scanty, high colored and contains phosphates or urates in excess. Indicanuria and oxaluria may at times be observed.

The patient complains of headache and dizziness and loses flesh as a consequence of the lack of proper digestion and assimilation, he sleeps poorly and may be melancholic. A febrile movement is but very rarely a characteristic of this disease and the pulse rate is variable. Reflex dyspnoea and palpitation may be present. The so-called stomach cough is probably not due to any gastric condition but is much more likely to be due to pulmonary tuberculosis and the clinician should always be on the lookout for beginning apical lesions when indefinite stomach symptoms are described. Many such instances are treated by the gastrologist to the great detriment of the patient.

The course of chronic gastric catarrh is long and complete recovery hardly to be expected. The symptoms can, however, be held in abeyance by proper diet and treatment and the patient's usefulness and enjoyment of life may continue with little impairment.

The Stomach Contents. The quantity withdrawn after a test-meal is usually considerable and much mucus is present unless there is total atrophy of the glandular coat. The hydrochloric acid and pepsin are deficient and in instances of glandular atrophy there may be total achylia. Bacteria, a few blood cells, sarcinæ and epithelial cells are often seen. Usually a number of test-meal examinations must be made before the true state of the patient can be determined with certainty.

Treatment. Prophylaxis consists in the avoidance of the errors in diet and mode of life that are likely to cause this condition. The food should be of proper quality and quantity, it should be eaten at regular intervals, and slowly and thoroughly masticated. Excessively hot or cold fluids should not be drunk and the abuse of alcoholic beverages and tobacco must be avoided. Proper attention should be paid to the care of the teeth, and where these are beyond repair, artificial ones should be provided. The use of the tooth-brush after every meal should be advised, together with the removal of all food particles from between the teeth by means of a wooden tooth-pick or dental silk. The mouth should also be rinsed after eating with a suitable wash such as equal parts of hydrogen dioxide and liquor antisepticus, or lime water and water.

Conditions of the heart, liver or kidneys to which gastric congestion is often secondary should be carefully treated. In cardiac lesions, when compensation is likely to become disturbed, digitalis, either alone or in combination with strychnine, should be prescribed. The digitalis is unlikely to disturb the gastric function and under its use the congestion disappears, and the

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appetite and general condition improve. If the drug disturbs the stomach it may be given *per rectum*, in the form of the infusion, or hypodermatically as one of the glucosides.

Lavage. By this means we are able to remove from the stomach the excessive accumulation of mucus with which it is burdened and to relieve the organ of its retained content of fermenting food. It is the mode of treatment *par excellence* in gastritis with excessive mucous production and muscular atony. In this form of the inflammation frequent washings are necessary, while in atrophic gastritis with little production of mucus the procedure need not be undertaken so often. In mucous gastritis the frequency of the lavage depends upon the state of the gastric inflammation, but usually once a day is sufficient. In marked instances, with large quantities of mucous and advanced atony, lavage before breakfast and in the evening may be necessary. The most favorable time for stomach-washing is in the evening before supper, since at this time the stomach has been quiet since the noon meal—which in these patients should be the principal one—and the supper to be taken afterward will as a rule be light. The tube having been passed, the mucus may be removed, allowing the water to run in under considerable pressure, the patient being recumbent and directed to change his position from time to time. No mucus may appear until the stomach has been relieved of whatever food it may contain but, after this has been washed out, further lavage will usually detach mucus from the wall of the organ in considerable quantity. Certain substances calculated to dissolve the mucus may be added to the wash-water; among these may be mentioned sodium bicarbonate (one to two hundred and fifty), lime water (one to five hundred), and sodium chloride (one to two hundred). Alkaline mineral waters may also be employed. If the stomach contains decomposing and fermenting food a final washing with a disinfectant solution is indicated. Of these there are a number, such as one-tenth of one percent. salicylic acid, one percent. boric acid, one percent, resorcinol, six-tenths of one percent, hydrochloric acid, one percent. chloroform water. This last is prepared by adding the chloroform, shaking the mixture, allowing the chloroform to settle and using the supernatant water which is poured off.

In the atrophic form of chronic gastritis, with little mucus, lavage should be employed to stimulate the stomach-lining directly. Decinormal hydrochloric acid solution may be used and, if stomach analysis shows enzymes to be still present, a solution of sodium chloride not stronger than one percent. is recommended.

Drug treatment plays a less important part in the management of the affection than do lavage and diet regulation. Of the drugs likely to prove beneficial silver nitrate may be mentioned. It may be given by mouth—one-fifth of a grain (0.012), to peppermint water one ounce (30.0); dose one-half of an ounce (15.0) three times a day when the stomach is empty—by means

of the intra-gastric spray of a one to one-thousand solution, or the organ may be washed with a one to two-thousand solution. One of the most valuable combinations for use in this consists of six grains (0.30) of resorcinol, fifteen minims (1.0) of tincture of nux vomica, and one drachm (4.0) of peppermint water in two ounces (60.0) of water after each meal. Bismuth salts, especially the subgallate and the subnitrate given together, often produce good effect. A powder of one part of the subgallate to three parts of the subnitrate may be prescribed, of which the dose is thirty grains (2.0) three or four times a day, or this powder may be applied directly to the lining of the stomach by means of an intra-gastric insufflator. The disadvantage of the bismuth treatment is its likelihood to produce constipation, consequently in connection with it laxative mineral waters and diet should be advised.

In the management of symptoms drugs are often necessary. Of the symptoms which are likely to need attention pain is one. Diet and stomach washing may be sufficient treatment, but if the pain is very distressing the patient may be put to bed and hot compresses should be applied over the stomach. Opium should be used only as a last resort and may be administered hypodermatically as morphine sulphate or *per rectum*.

Vomiting is seldom distressing where lavage is employed. When necessary, this symptom may be controlled by sucking bits of cracked ice, by iced champagne taken in small quantities, and by intra-gastric sprays of weak cocaine or menthol solutions.

Eructation may be controlled by lavage or by capsules of heavy magnesia or sodium bicarbonate with or without the mixture of a little sodium subsalicylate. Animal charcoal in doses of from ten to twenty grains (0.65 to 1.30) is also useful.

Constipation is a frequent accompaniment of chronic gastritis. It should not be treated by laxatives but by dietetic means, mineral waters, abdominal massage and by irrigations, if necessary.

Loss of appetite may prove an annoying symptom. It may be managed by various means. Stomach washing with sodium chloride or hydrochloric acid solutions and the administration of the vegetable bitters, especially condurango, nux vomica and gentian, or of basic orexin are recommended. This last is best given in broths in doses of about three grains (0.20) before meals.

Artificial digestants are of very limited value. The administration of pepsin either alone or with hydrochloric acid does not increase the digestive power but when there is lack of the stomach ferments and of hydrochloric acid, the latter should be supplied. The dilute acid should be administered in doses of about twenty drops (1.30) after meals, well diluted and taken through a glass tube; if not well borne the dose should be diminished or sodium bicarbonate and pancreatin in doses of five grains (0.30) each should be substituted. These are especially useful in old chronic instances.

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By means of the pancreatin and the alkali, which must be given in sufficient quantity to neutralize the acidity of the stomach, if any remains, pancreatic digestion is performed in the stomach. Other artificial digestants, of which there are a number on the market, are of little use,

Mineral Waters. The great benefit that sometimes accrues from courses of spa treatment is probably due rather to the rigid regulation of diet and mode of life than to any special therapeutic effect of the mineral waters drunk. It may be stated, however, that in chronic gastritis the salt and alkaline waters, as well as the alkaline-saline and alkaline-hydrochloric waters are useful. When drunk in large quantities they tend to cleanse the stomach of its excess of mucus but in this connection they cannot, in more than a very limited way, take the place of lavage. It would seem that the alkaline, alkaline-hydrochloric and sodium sulphate waters are likely to benefit gastritis with increased or only slightly diminished gastric hydrochloric acid while the alkaline and saline waters are useful in diminished gastric secretion. In decreased stomach motility with dilatation only small quantities at a time should be allowed.

General Hygiene. For patients who have become weak and emaciated a rest cure should be prescribed. For those of moderate bodily vigor a morning cold tub or sponge, if there is good reaction afterward, is advisable. Cleansing baths of warm water may be taken twice a week. Exercise in moderation should be systematically taken. Five minutes' work with light dumb-bells or clubs before breakfast, at noon, and at bed time, together with walking, golf, horseback or bicycle riding or a moderate amount of swimming or rowing, is an excellent means of keeping the muscular system in condition. Exercises of the muscles of the abdomen, such as those described in works upon physical culture are important in all gastric abnormalities except those attended by hæmorrhage.

Electricity, while it probably has little or no effect upon the secretion or motility of the stomach, is an excellent adjuvant to other treatment of chronic gastritis. Both the galvanic and faradic currents may be employed. Faradism acts in the same fashion as massage and should be administered by applying one electrode to the spinal region while with the other the limbs, and particularly the abdomen, are stroked. Intra-gastric electricity with Einhorn's electrode, by means of which both the faradic and galvanic currents may be applied, is useful and makes an excellent impression upon the patient.

Massage has a particularly good effect in gastritis with dilatation and atony and in patients too weak to take proper exercise. Both general massage and local massage over the abdomen are indicated. The latter plays an important part in sustaining the tone of the abdominal muscles, and, when given directly after a meal, aids the atonic organ in passing its contents into the intestine. The Rose plaster bandage is also of great value.

Diet is perhaps the most important factor in the treatment of chronic gastritis. No fixed list of proper articles of food can be given but each patient must be studied by himself both from a standpoint of his symptoms and with a view to the chemical findings upon stomach-contents analysis. In prescribing a diet the patient himself can materially assist by informing the physician as to what articles of food agree and what do not. At the beginning of treatment the diet should be light and easily digestible and, if the gastric musculature is functioning properly, fluids and semi-fluids should make up the dietary to a great extent. Oftentimes a patient will do better on a number of small meals daily than on three large ones. If the analysis shows hydrochloric acid and pepsin to be present in considerable quantity we may give a diet containing considerable proteid, but, even when there is lack of secretion of these elements, proteid need not be wholly eliminated. Carbohydrates in which there is no admixture of large amounts of cellulose and those which are not likely to ferment are allowable and fat, even in considerable quantity, is not harmful.

The preparation of the food is important. Meats and fish should be cooked in a steam boiler and if necessary may be minced before being served; in all cases they should be finely divided before they reach the patient's mouth.

Milk is an excellent food but often patients bear it ill. In such instances it may be mixed with other articles of diet as purée soups, cereals, etc. When given thus it is usually well digested; often the addition to it of Vichy or lime water will render it less liable to undergo fermentation. Soups and meat jellies are usually well borne as are the white meats, sweetbreads, scraped beef and fish. It should be remembered that only small quantities of meat should be given at a time. Cereals are excellent and the lighter vegetables, potatoes, beans, peas, asparagus, etc., may be given in the form of thick soups, which when properly made are very appetizing. Mashed potatoes are allowable and toast or zweiback is preferable to plain bread. Stewed ripe fruits and puddings of rice, tapioca, sago, etc., may be given. It need hardly be stated that highly seasoned foods are out of place although a little mustard or pepper may be given at intervals to increase the appetite.

Such alcoholic drinks as beer, because of the yeast which it contains, and spirits should be avoided and it is better in most instances to forbid the use of fermented beverages entirely, but if they are allowed, a pure wine containing no tannic acid is best. Certain instances of gastritis due to over-indulgence in alcohol seem to digest better if wine is allowed; a good port, tokay or malaga is to be preferred. If lactic acid fermentation occurs upon the use of these sweet wines a good dry champagne may be substituted. Naturally the quantities taken should be small.

Coffee in moderate amount may be taken, but tea, on account of its constipating effect, and tobacco should be stopped.

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PHLEGMONOUS GASTRITIS.

Synonyms. ~~f~~Suppurative Gastritis; Purulent Gastritis.

Definition. A rare form of gastric inflammation characterized by a diffuse infiltration of the submucosa, with pus, which may extend to the muscular and peritonæal coats of the organ. Occasionally the pus is localized in an abscess cavity.

Ætiology. This condition may occur idiopathically. Primary phlegmonous gastritis, however, is very rare, most instances being secondary to infectious processes, pyæmia, puerperal sepsis and typhoid fever, for example. The suppurative process may also result from infection of an ulcer or new growth or from traumatism.

Pathology. In the diffuse form the submucosa of the pyloric region is most likely to be the seat of the process. This portion of the wall of the stomach is infiltrated with pus and may necrose; the other coats are thickened. Perforation may take place through the mucosa and the pus may exude into the cavity of the organ. If there is abscess formation, single or multiple collections of pus will be observed.

Symptoms. In secondary phlegmonous gastritis the symptoms closely resemble those of peritonitis with sepsis; there are usually abdominal pain more or less distinctly localized epigastric tenderness, meteorism, vomiting—the vomitus rarely contains pus, however—diarrhœa, a septic temperature, small, rapid pulse and great prostration. In patients with abscess formation a tumor may be palpable. If the disappearance of such a manifestation is coincident with the vomiting of pus, there is good ground for making a diagnosis of suppurative inflammation of the stomach. Simple vomiting of pus, however, may occur in other conditions, such as an œsophageal or other abscess which may have ruptured into the stomach. Rupture may take place through the wall of the stomach into the peritonæal cavity with the accompanying symptoms of perforation. The disease is quickly fatal, almost without exception.

Treatment. If the diagnosis is made in time, surgical treatment offers some hope and is always indicated; otherwise the treatment is purely symptomatic. Medication given by mouth is ineffectual. The pain may be lessened by holding cracked ice in the mouth, applications of cold to the epigastrium and by hypodermatic injections of morphine. Stimulants given hypodermatically and *per rectum* are indicated.

TOXIC GASTRITIS.

Definition. An inflammation of the stomach caused by traumatism or swallowing caustic substances, such as acids, alkalies, arsenic, mercury bichloride, etc.

Pathology. The *post mortem* appearances differ with the degree of the

corrosion of the gastric lining. Marked instances reveal a dark eschar covered with necrotic mucous membrane bordered by an inflamed margin. In less severe instances the cells of the gastric mucous membrane are swollen, degenerated and eroded. There may be hæmorrhages and ulceration. The fundus exhibits the most marked degree of irritation because this region is reached first by ingested substances. In instances which recover, the healed cicatrices may contract and produce deformities of the organ.

Symptoms. These vary in severity with the degree of the irritation, but as a rule there is marked gastric pain, localized tenderness, vomiting and thirst. The vomitus often contains blood, mucus and pieces of exfoliated mucous membrane. Marked instances are characterized by an expression of anxiety, weak, rapid pulse and symptoms of collapse which may terminate in death within a few hours.

Diagnosis. This is made from the history, but, when this is wanting, eschars about the lips and in the mouth, together with the odor of the breath may suggest the causative factor.

Treatment. This consists in the administration of antidotes both chemical and physiological; the chemical antidotes in the case of acids being alkalis, sodium bicarbonate for instance, and for alkalies, mild acids such as dilute vinegar. The irritation may be soothed by demulcents—milk, albumin water, mucilages, etc.—and free dilution of the toxic substance by drinking water is always indicated. The collapse necessitates free hypodermatic stimulation by means of strychnine, alcohol, etc., and high rectal injections of hot black coffee. The after treatment consists of rest for the stomach, rectal alimentation and the bismuth salts in large doses.

DIPHTHERITIC GASTRITIS.

This is a rare inflammation and may occur as a complication of true diphtheria of the upper air passages or an extension of a throat or laryngeal Klebs-Löffler infection to the gastric mucous membrane. Gastritis with the production of a false membrane may also occur as a complication of the various infectious diseases, smallpox, typhoid and typhus fevers, septicæmia, scarlatina and pneumonia. The lesion cannot be diagnosticated *intra vitam*, and is therapeutically of no interest.


MYCOTIC GASTRITIS.

Instances have been reported of gastric infection with certain fungi, notably those of thrush and anthrax. These have followed infections of the mouth; yeast fungi also have been known to set up gastric inflammation. Fortunately the acidity of the gastric secretion is usually able to destroy the micro-organisms swallowed and in instances in which lesions of this variety

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have occurred the gastric functions have been at low ebb. The larvæ of the common house fly and other insects have been known to produce inflammations of the stomach.

ULCER OF THE STOMACH.

Synonyms. Gastric Ulcer; Peptic Ulcer; Round Ulcer; Embolic Ulcer; Thrombotic Ulcer; Perforating Ulcer; *Ulcus Ventriculi*. 

Definition. A loss of continuity of the substance of the mucous lining of the stomach, not tending to heal but rather to increase both in area and depth. The acute form is likely to spread by increasing its depth while the chronic variety tends to spread laterally; its walls usually slope inward toward the base of the lesion while those of the acute type are more vertical and clearer cut. Perforation into a blood-vessel or through the muscular and peritonæal coats of the organ may occur in either type. The condition is usually characterized by gastric pain, digestive disorders, and at times hæmatemesis.

Ætiology. Gastric ulcer has been attributed to a number of causes. The disease seems to be rare in the United States, but it is probable that many instances are undiagnosed. It is most common in young adult females. According to Hemmeter there are five chief factors in the production of this lesion. (a) An interference with the vitality or resisting power of the mucous membrane. (b) Increased acidity of the gastric juice. (c) An altered condition of the blood. (d) Local bacterial infection. (e) Local traumatism.

The vitality of the wall of the stomach may be impaired by local or general diseased conditions or by interference with the blood supply of a particular area. Thrombosis, usually the result of disease of the blood-vessels, and embolism, infective or non-infective, are the common causes of this interference.

Constitutional diseases, such as the blood dyscrasias, syphilis, tuberculosis, arterial diseases of various character, malaria, etc., are to be considered.

Of bacterial infections the most common are those of tuberculosis, typhoid fever and various types of dysentery. Other bacteria have been found in instances of gastric ulcer and may exert a causative influence upon the condition. It must be remembered that while hydrochloric acid is germicidal it does not destroy bacterial spores and there are times when the glands which secrete this acid are at rest and consequently the antiseptic action of the hydrochloric acid is slight or absent. Hemmeter suggests that the bacteria cause a primary necrosis and encourage ulcer formation through autodigestion.

Direct injury and consequent impairment of the power of resistance of the mucosa may be the result of the traumatism from the swallowing of various foreign bodies such as fish bones, oyster or nut shells and the like. Corrosive poisons and the ingestion of very hot liquids or food are factors worthy of consideration and certain observers have exploited the theory that the fre-

quency of ulcer, in those in whose work pressure upon the stomach is exerted, may be due to an anæmia of the organ resulting from such pressure.

Pathology. Ulcer of the stomach exists by a large percentage most often upon the posterior wall or lesser curvature of the organ and it is rare that a single lesion is found, the condition being usually multiple. The typical round punched-out appearance is not so often seen as is the oval non-symmetrical ulcer with irregular edges. The edges usually slope inward since the mucous coat of the organ is first involved. If there is no tendency toward healing the lesion progresses through the muscular coat and finally perforates the peritonæum covering the viscus. The typical ulcerous perforation is circular and has as cleanly cut edges as if punched out with a die, but as above stated this form is less often seen than the less symmetrical type. During the progress of the lesion the blood-vessels in the stomach wall may be eroded, resulting in hæmorrhage more or less profuse in type. A healed ulcer leaves behind a distinct and typical scar. Accompanying the ulcer there is, as a rule, a complicating gastritis.

Symptoms. The most characteristic symptoms of gastric ulcer are: (a) *Localized pain.* This is due to irritation of the sensory nerves laid bare. It is burning in character, most marked after the ingestion of food and frequently increases during the process of digestion. There is local tenderness which is increased on pressure, or by the wearing of a corset. Various other pains due to sympathetic neuralgias of the intercostal nerves, of the left brachial plexus and even of the nerves of the lower limbs may be present. A point of tenderness, "the dorsal point," sometimes exists at the back to the left of the spinal column at the level of the tenth to the twelfth dorsal vertebra.

In many instances there is an unpleasant burning sensation in the region of the stomach which is due to irritation of the organ from its hyperacid contents. This "heart-burn" may also be referred to the region of the cesophagus.

(b) *Vomiting.* This is the result of excessive peristalsis and reverse peristalsis caused by the irritation and increased acidity due to the ulcer. The vomiting exercises an influence favorable, rather than otherwise, over the course of the disease since the emptying of the stomach allows it to collapse, thus bringing the edges of the ulcer into approximation. The vomiting is usually followed by a temporary relief from pain.

(c) *Vomiting of blood* is a very characteristic symptom of gastric ulcer and is the result of erosion of the blood-vessel. If the hæmorrhage is large a considerable quantity of pure dark blood may be vomited, if small, the blood may remain in the organ, undergo partial digestion and be later vomited as "coffee-ground" matter. The blood resulting from gastric hæmorrhage is frequently not vomited *in toto* but part may pass through the intestine and

appear in the stools as a black, tarry matter. Muscular exertion of any character may induce hæmorrhage.

Excessive hydrochloric acid is present in a large majority of instances of gastric ulcer and by most authorities is considered as a causative factor, rather than a result of the lesion.

The appetite is usually normal or increased, the tongue is not coated, and there is likely to be excessive thirst.

Constipation is the rule but a normal condition of the bowels may exist, although the quantity of fæcal matter is likely to be small owing to the lessened quantity of food ingested. The urine is hyperacid except after emesis when it may be alkaline because of the large amount of acid suddenly withdrawn from the body. The chlorides are diminished.

The blood, except after hæmorrhage, when the number of red cells may be much diminished, usually shows a slight decrease in the number of the erythrocytes and a considerable diminution of the hæmoglobin. After hæmatemesis there may also be what is called a "post-hæmorrhagic leukocytosis." This usually disappears within a few days.

A distinctly palpable tumor is rarely felt except in old lesions with thickened cicatrices or adhesions to neighboring parts. If a tumor is felt, as a rule it is small, smooth of surface, and not movable.

The ulcer may proceed toward healing, leaving a cicatrix behind when the process is completed. This latter may contract, producing the hour-glass stomach, or a stenosis of the pylorus with consequent dilatation and ptosis, in accordance with the original situation of the lesion, or it may undergo carcinomatous degeneration.

In other patients the ulcer may perforate the stomach wall and bring about a local peritonitis if adhesions sufficient to shut off the site of the perforation have formed, or, failing this, a general peritonitis. Perforation upward through the diaphragm resulting in pyopneumothorax is a less frequent complication.

Diagnosis. By means of the test-meal and stomach tube this is hardly necessary, and the passage of this instrument, except by a skillful hand, is hardly to be advised. The only striking abnormality found upon chemical examination of the stomach contents in ulcer is an abnormal amount of free hydrochloric acid. Digestion does not seem to be delayed in ulcer, but is, on the contrary, often accelerated.

Howard in a series of fifty-four instances of ulcer of the stomach and duodenum reports the following findings. *Total amount of residue:* fifty-four percent. above normal, seventeen percent. below normal, twenty-nine percent. within normal limits. *Total acidity:* Hyperacidity in twenty-seven and one-half percent. hypo-acidity in forty-two and one-half percent., within normal limits, thirty percent. *Free hydrochloric acid:* Hyperchlorhydria in only seventeen and six-tenths percent., normal con-

tent of hydrochloric acid in twenty-six and four-tenths percent., hypochlorhydria in twenty-six and four-tenths percent. Tests for lactic acid were employed in forty-three patients with positive result in fourteen percent., doubtful in seven percent. and negative in seventy-nine percent. The statement so positively made by most authorities with regard to excessive free hydrochloric acid in ulcer is hardly borne out by the above figures. Hæmorrhage occurring with attacks of pain is very characteristic. In the absence of this sign, local pain and tenderness, a dorsal point of pain, and especially if these are increased by food, the diagnosis becomes probable. Cirrhosis of the liver should be excluded by absence of the symptoms and signs of this disease, although the vomiting of blood suggests it. The sudden onset, longer duration, and its sudden and absolute ending and the presence of jaundice make for the diagnosis of gall stones. Chronic gastric catarrh usually presents diminished free hydrochloric acid and the vomiting may be accompanied by pain. The gastralgia in neurotic individuals has usually a suggestive history, pains are more marked when stomach is empty, and they are relieved by pressure and by food, and there are usually no tender points. There is sometimes considerable difficulty in distinguishing ulcer from cancer and this will be considered under that head. However, an ulcer which is in the process of repair gives rise to a small tumor, pyloric stenosis and secondary dilatation, but the age of the patient, amount of free hydrochloric acid, the dorsal pain-point, the defined tenderness, and particularly the antecedent history generally establishes the diagnosis.

Prognosis. This is good so far as recovery from the attack is concerned. The disease is variable as regards its course but under proper treatment ninety-five percent. of instances should terminate in recovery in from twelve to fourteen days. Complete cure, however, should hardly be claimed until the patient has been without gastric pain for a number of months. Frequently the excess of hydrochloric acid remains after recovery has taken place and needs attention. Relapses and repetitions of the acute symptoms are seldom met with if proper treatment is carried out for a considerable period of time. Sometimes cancer may supervene and this will diminish the percentage of ultimate cures.

Treatment. *Prophylaxis:* Patients with increased acidity and subject to discomfort and pain referred to the stomach, without definite signs of ulcer, should be put upon a simple non-irritating diet, and extremely hot or cold food or drink forbidden. The hyperacidity should receive drug treatment.

In the treatment proper of gastric ulcer the problems confronting us are:

1. To encourage healing on the part of the ulcer by (a) enforcing as complete rest as possible; (b) protecting it from irritation by food and from other mechanical injury, and from irritation from chemical sources; (c) by counteracting the secretory fermentive abnormalities taking place within the organ.
2. To treat the distressing symptoms of the condition as they may arise.

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3. To maintain the bodily strength by the administration of nourishment *per rectum*.

A period of complete rest in bed on the part of the patient, to last until the gastric pain and tenderness have disappeared, should be enjoined. Unless hæmatemesis has recently occurred or is anticipated, he may read, write and receive visitors in moderation and a daily sponge bath, with or without alcohol, should be given.

Gentle massage of the limbs will add to the patient's comfort and augment his recuperative power.

In order to protect the ulcer from irritation and to encourage it toward healing the heaviest of the bismuth salts—the subnitrate—is administered in dosage of ninety to one hundred and twenty grains (6.0 to 8.0) if given by the mouth, daily. The salt possessing the highest molecular weight is preferable since it will be most likely to sink to the dependent portions of the stomach and consequently come in contact with the ulcerating surface wherever situated. Fleiner, who has been the special advocate of the use of bismuth, is accustomed to administer the drug as follows: Before food is taken in the morning the stomach is washed until the washings return clear and non-acid in reaction; then through the tube two and one-half to five ounces (75.0 to 150.0) of bismuth subnitrate, free from arsenic, suspended in six to eight ounces (240.0 to 300.0) of water are given. After the withdrawal of the tube the patient should assume the recumbent position and remain quiet, so that the mixture may come into contact with the ulcer if possible. If the patient is receiving food by mouth he may take his breakfast within a half hour. The bismuth acts not only as a non-irritant protective to the ulcerating surface but favors the healing of the lesion by an antiseptic and astringent action. It is said, also, to decrease the excessive acidity. Being given by the mouth the bismuth is quite as effective as though the tube and passing this instrument may be omitted without influencing the efficacy of the treatment. The insufflation of the drug in powdered form has been practised but presents no advantage over the ordinary method of administration.

In the employment of the bismuth treatment Hemmeter uses one drachm of the subgallate (4.0) to three (12.0) of the subnitrate in a pint (500.) of water. He previously washes out the stomach with a solution of sodium bicarbonate one-half of an ounce (15.0) to the pint (500) of water.

The problem of neutralizing the excessive acidity present in the stomach is often not met successfully because the attempt is not made according to chemical principles. Sodium bicarbonate, a drug frequently employed, is worse than useless since its presence in the stomach results in an excess of sodium chloride and carbon dioxide. The former will split up and give rise to still more hydrochloric acid, while the latter stimulates peristalsis, both of which results are exactly at variance with our purpose. The most effectual method of combating the hyperacidity is by administration of heavy

magnesia in dosage of ten grains (0.65) every four hours. In addition to the reduction of the existing hyperacidity and the prevention of the formation of additional hydrochloric acid from the chemical combination resulting, magnesium chloride is formed which exercises a favorable influence upon the usually co-existent constipation.

Numerous other treatments of gastric ulcer have been from time to time exploited and among them may be mentioned Cohnheim's olive oil treatment which consists in administering this substance in doses of from one to four ounces (30.0 to 120.0) three times a day, passed into the fasting stomach, which has previously been washed; as in the case of the bismuth treatment the oil may be swallowed without the use of the tube. It would seem, however, that a previous lavage would increase the efficacy of this treatment, since its object is to allow the oil to come into direct contact with the ulcer and form a protective coat for it. It is claimed also that the oil relieves the nausea and pain, diminishes the excessive acidity and lastly is a food itself. It is asserted that the milder instances may be fed by mouth during the treatment—the diet, of course, being properly restricted—and strict rest in bed is not necessary.

The systematic rest and mineral water treatment advocated by Fox and, with certain unimportant modifications, by von Leube and von Ziemssen is not adapted to the acute instances with hæmatemesis but, after the intervention of two weeks succeeding such an occurrence, it may be pursued. The details of the treatment are as follows: The patient is kept in bed, not even being allowed up to evacuate the bowels and bladder, and is given every morning a glass of Saratoga, Carlsbad or Hathorn water (either of which has quite as beneficial effect as the imported Mühlbrunnen of the original treatment) to which seventy-five to one hundred and fifty grains (5.0 to 10.0) of Carlsbad sprudel salts (natural or artificial) have been added. The mineral water exerts no specific action, but serves only to keep the bowels open and to lessen the gastric acidity. Local applications to the epigastrium of a flannel compress dipped in hot water and covered with oiled silk are prescribed and renewed every three hours, night and day. The diet for the first two weeks of the treatment is limited to milk and beaten eggs. During the third week the patient is allowed to move from his bed to a lounge, but is still kept very quiet, the mineral water is continued, and toast or zweiback, oysters, broiled fish, sweetbreads, calf's brain, or meals of very finely chopped meat may be allowed in small amount. During the fourth week vegetable purées of peas, beans, potatoes or other vegetables, and stewed fruits are permitted. From now on the patient may gradually return to ordinary diet, but for years all raw fruits, acid, highly seasoned, cold or hot food and drinks must be interdicted.

In connection with this treatment Hemmeter employs the following prescription to assist in reducing the excessive acidity and prevent auto-digestion.

R̄ magnesi oxidī ponderosi, sodii bicarbonatis, potassii carbonatis, āā, gra. lxxv (5.0); sacchari lactis, ʒ viiss (26.0). Of this half a teaspoonful (2.0) is taken dry on the tongue every three hours.

Silver nitrate has been recommended by Gerhardt. According to his report the distressing symptoms will often cease directly upon its administration, while in other instances it has no influence whatever and in still others it seems to aggravate the symptoms. He believes that this drug is useful in patients who suffer pain when the stomach is empty, on account of its neutralizing effect upon hydrochloric acid. His method is to give this agent in doses of from one-tenth of one-half a grain (0.006 to 0.03) in solution several times in the twenty-four hours upon an empty stomach.

Boas considers silver nitrate useful especially in the less severe instances of ulcer and in those for whom it is impossible to institute a rest cure. He starts the treatment with half an ounce (15.0) of a one grain (0.065) to one ounce (30.0) solution of the nitrate in peppermint water three times a day in an empty stomach. Later he increases the strength of the solution to one and one-fifth grains (0.07) to the ounce (30.0) and still later to one and three-fifth grains (0.1) to the ounce (30.0). In connection with this treatment the diet must be carefully regulated and the patient should remain as quiet as possible.

Numerous other drugs have their advocates in the treatment of ulcer, among which may be mentioned chloroform. Stepp considers that this agent given in connection with bismuth—chloroform, one; bismuth subnitrate, three; distilled water, one hundred and fifty parts—exerts a favorable influence.

Condurango, in the opinion of Gerhardt, acts well especially in old ulcers, in poorly nourished patients.

Fuchs believes that the action of the bismuth upon the ulcer is not alone due to its neutralizing effect upon the hydrochloric acid and to the fact that it is mechanically a protective but that the subnitrate is reduced to an oxyhydrate which, being dissolved, is absorbed by the granulating tissue and here acts specifically. It also increases the secretion of mucus which has a considerable protective action. Bismuthose, a combination of bismuth and albumin is more astringent than bismuth, more insoluble, and has a greater acid-combining power. Elsner reports good results from its use. Its great disadvantage, however, is the influence of its astringency upon the co-existent constipation. It is particularly useful in combating hyperacidity.

The treatment of the excessive acidity often present in ulcer has received much attention and various methods have been recommended as applicable to the reduction of this manifestation. Ewald uses the alkalies mixed with powdered rhubarb and sugar. Others advocate the use of sodium bicarbonate, which according to chemical principles directly defeats the object with which it is given. Riegel, in uncomplicated instances, advises the following

formula: \mathcal{R} sodium bicarbonatis, magnesii oxidi ponderosi, āā, $\mathfrak{Z}\text{ii}$ (8.0); sacchari lactis, $\mathfrak{Z}\text{iii}$ (12.0). To this a small amount of powdered rhubarb may be added if the constipation is marked. Of this one-half of a teaspoonful (2.0) after each meal is prescribed. To patients in whom the increased acidity is continuous the alkali should be given more frequently and in smaller doses.

Atropine has a decided influence in diminishing the secretion of the gastric juice and consequently it and belladonna have their place in the treatment of hyperchlorhydria.

The treatment of the pain is to a certain extent that of the hyperchlorhydria since the former is the result of the latter. Usually the administration of analgesics is unnecessary, for as a rule the pain disappears within a day or two after the institution of the ordinary treatment. In severe instances, at the beginning, the hypodermatic use of morphine is indicated; however, according to recent investigators, this is likely to cause an increase in the secretion of gastric juice and consequently is to be avoided if possible. Codeine and its phosphate are sanctioned by high authority. Cannabis indica, while acting as a hypnotic to a very slight degree, is likely to cause disagreeable mental phenomena. Strontium bromide is recommended. Orthoform (methyl ester of amido-oxybenzoic acid) is said to have a marked effect upon the pain of ulcer, and Murdoch believes that gastric pain which is relieved by this drug augurs the existence of ulcer.

Local applications such as poultices of flax-seed may afford relief but the Priesnitz *umschlag*—flannel wrung out in hot water and covered with oiled silk—will usually be found to act as well. Sharply localized pain due to peritonitis may be relieved by the ice bag or coil.

Vomiting seldom needs special treatment since it usually ceases upon the institution of the ordinary course of treatment directed toward the cure of the ulcer. If this symptom continues to distress the patient cracked ice may be given and various anti-emetics such as cerium oxalate, five to ten grains (0.30 to 0.60), chloretone, five to fifteen grains (0.65 to 1.00), dilute hydrocyanic acid, two to six minims (0.12 to 0.4) in water, or chloroform, one to two minims (0.065 to 0.12) in water, may be used.

Hæmatemesis and its treatment will be presented on page 394.

Feeding in Gastric Ulcer. During the progress of the treatment most approved by the author—i.e., that of bismuth subnitrate combined with heavy magnesia—the patient is fed entirely by rectum. A nutrient enema, preceded by a high rectal irrigation of about a quart (litre) of normal saline solution at about 105° F. (40.5° C.) to cleanse the intestinal mucous membrane and facilitate absorption, is administered every four hours. The enema preferred by the author consists of one-half to one ounce (15.0 to 30.0) of starch paste with two to three ounces (60.0 to 90.0) of beef extract, liquid peptonoids, or panopepton.

Rectal feeding should usually be continued for about two weeks.

Other enemata useful in this disease may be chosen from the following formulæ:

1. Milk, four ounces (120.0); the yolks of two eggs; salt, one drachm (4.0); claret, one ounce (30.0); aleuronat flour, one-half ounce (15.0). (Boas.)

2. Two or three eggs beaten with a little water; one ounce (30.0) of dextrinized flour boiled with four ounces (120.0) of twenty percent. solution of lactose; one wineglass (30.0) of claret, a little salt. The eggs should not be mixed with the other ingredients until the latter have cooled so that their temperature will not coagulate the albumin of the former.

3. Bouillon, eight ounces (240.0); wine, two ounces (60.0); the yolks of two eggs; dry peptone one to five drachms (4.0 to 20.0). (Jaccoud.)

4. Milk, eight ounces (240.0); two to three eggs; a little salt. (Riegel.)

5. Milk, eight ounces (240.0); liquid peptone, one ounce (30.0); yolk of one egg; laudanum, five drops (0.30); a small quantity of sodium bicarbonate for chemical neutralization if the peptone is acid. (Dujardin-Beaumetz.)

6. Two eggs; whiskey, one-half ounce (15.0); starch paste, one-half ounce (15.0); milk up to eight ounces (240.0).

Other formulas may be made up as occasion requires. In quantity nutrient enemata, according to most authorities, should not exceed three or four ounces (90.0 to 120.0), and the proper interval for their administration is about every four hours. Four enemata during the twenty-four hours are sufficient.

When enemata larger in quantity than the above are well borne it may be wise to give as a routine three daily injections of a pint (500.0) of food each. This procedure relieves the patient of too frequent disturbance and allows his sleep to be unbroken. The enema may consist of the whites of two eggs, a teaspoonful (4.0) of salt, one and one-half ounces (45.0) of a saturated solution of glucose, and milk up to a pint (500.0). Such a mixture contains carbohydrates, fat, proteid and salts in approximately proper proportions.

Nutrient enemata, particularly those of considerable size, are better given from a fountain syringe than by means of the piston variety, since the force and tendency of the latter to sudden spurts may cause irritability of the bowel.

Food given *per rectum* will be more readily absorbed and assimilated if peptonized, and not only the milk but the other constituents of nutritive enemata should undergo this process. Preparations for the convenient peptonizing of food substances are obtainable from any apothecary. By certain patients the enemata may not be well borne or may be difficult of retention on account of irritability of the bowel. Such a complication may be obviated by preliminary cleansing of the bowel by a saline enema and, if this

procedure fails, by the addition of a small dose of the tincture of opium to each enema.

Nutrient enemata should be thoroughly mixed and administered warm, 100° F. (37.8° C.), under moderate pressure and very slowly through a soft rubber rectal tube passed as high into the bowel as possible. Care should be taken lest the tube turn on itself and its extremity, instead of being in the sigmoid flexure, be just inside the anus. The best position for the patient to assume while receiving the enema is upon the left side. After about thirty minutes he should turn to the right side and a pillow should be placed under his hips. These positions facilitate the flow of the enema through the colon. At intervals it may be necessary to give a high enema of clear water for the relief of the thirst.

After the cessation of rectal feeding the return to ordinary diet must be very gradual. The first foods allowed by mouth may be equal parts of milk and lime water, beef bouillon, to which such substances as plasmon, nutrose or somatose may be added, and albumin water. These fluids must be given at a neutral temperature—neither hot nor cold. Sugar solution (twenty percent.) may also be allowed. Dextrose is the preferable form of sugar, but cane sugar is allowable. Lactose is least desirable. After about ten days a more liberal diet may be instituted consisting—according to von Leube—of boiled sweetbreads, calf's brain, white meat of chicken, various gruels and vegetable purée soups, tapioca with milk, oatmeal and finely scraped raw beef. After a week scraped raw ham, finely chopped rare broiled beef steak, toast or zweiback, and mashed potatoes are allowable, as also are stewed fresh non-acid fruits. Further extension of the diet should be postponed as long as possible, but when this becomes necessary the patient may eat broiled chicken and veal, rare roast beef, fish, plain meat soups, etc.

All irritating foods, such as vegetables containing an excess of cellulose, breads with hard crusts, fruits with tough skin, together with alcoholic beverages, should be refrained from until all the symptoms have disappeared and have remained absent for a long period of time. Cold and hot, sour or highly-spiced foods and drinks should be avoided for many months after the cure is apparent.

The anæmia so frequently accompanying gastric ulcer should never be neglected. To combat this important factor in the disease iron and arsenic are our chief reliance. It is needless to say that their administration should not be begun until all the symptoms of gastric irritation have disappeared. Ewald is accustomed to give a two or three percent. solution of iron sesquichloride three times a day in teaspoonful (4.0) doses in an ounce (30.0) of albumin water. This should be taken through a tube. The various forms of organic iron which have lately been put upon the market should be useful in this connection, particularly iron vitellin in half-ounce (15.0) doses given three times daily after meals.



Arsenic may be given in the form of Fowler's solution or arsenic trioxide. The various mineral waters containing iron and arsenic will be found useful.

The surgical treatment of gastric ulcer may be divided into: (a) The treatment of the ulcer by excision, (b) of hæmorrhage, (c) of perforation, (d) of gastro-peritonæal adhesions, (e) of the various resulting gastric deformities such as stenosis of the pylorus, hour-glass contraction, etc.

It is conceded by most surgeons that acute gastric ulcer is a medical condition but chronic ulcer with obstinate and persistent emesis and pain may be treated surgically by excision or cauterization. In multiple ulcer excision of all the ulcerating points is, however, impossible. Ulcers situated near the pylorus and associated with pylorospasm may be relieved and even cured by the operation of gastro-enterostomy. In ulcers of other regions of the stomach this operation may also afford relief.

Repeated hæmorrhage, unless the patient is too anæmic to withstand the shock of operation, probably constitutes an indication for surgical treatment. If possible the bleeding point should be cauterized or excised. If these are multiple, gastro-enterostomy should be performed.

Perforation should be treated surgically as soon as the diagnosis is made, unless it is an absolute certainty that adhesions shutting off the site of the perforation from the general peritonæal cavity have been formed. The longer the operation is postponed after the contents of the stomach has been emptied into the peritonæal cavity the less the likelihood of the recovery of the patient.

Adhesions about the stomach which cause pain and other unpleasant symptoms may necessitate surgical interference. Hour-glass contraction and other post-ulcerous deformities of the organ are also amenable to operative treatment.

CANCER OF THE STOMACH.

Synonyms. Gastric Cancer; Carcinoma of the Stomach; Carcinoma Ventriculi.

Ætiology. The direct ætiology of cancer is unknown. Heredity plays some part in its causation, and gastric ulcer is undoubtedly a predisposing cause. Cancer of the stomach is rarely seen before the middle age and is more common in males than in females. It not infrequently occurs in individuals who have had apparently healthy stomachs during their earlier years.

Pathology. Cancer of the stomach is usually primary. All varieties of carcinoma may occur in the stomach but the most frequently seen are:

(a) The scirrhus which is an infiltrating growth, hard and dense in structure; it usually involves a considerable portion of the submucosa and may spread through its whole extent.

(b) The medullary type develops rapidly, is likely to ulcerate, and is prone to extend directly or by metastasis to other structures.

(c) The colloid variety grows to a larger size than do the other types and frequently spreads by direct contiguity to neighboring tissues, making with them a mass of considerable size.

The majority of gastric cancers begin near the pylorus and from this point tend to extend along the curvatures, involving chiefly the submucous coat. The growth, as a rule, originates in the tubules, progresses, infiltrating and causing induration of the remaining tissues of the organ, and results in a nodular tumor which may ulcerate. The neighboring lymphatic glands become hardened and enlarged and may themselves become the seat of carcinomatous growth. When the tumor is at the pylorus, stenosis results which causes dilatation of the organ, otherwise the stomach tends to diminish in size. Ulcerations infrequently perforate the stomach wall but often erode a blood-vessel and cause hæmorrhage.

Symptoms. Before gastric cancer is suspected the patient is prone to indefinite symptoms referred to the stomach, such as loss of appetite, distress, eructations of gas and constipation, but it must be remembered that the growth may exist for considerable time without giving rise to any symptoms which call attention to the stomach. The cancerous cachexia, with its characteristic color of the skin, anæmia, and loss of flesh and strength becomes sooner or later apparent and palpation of the stomach may or may not reveal the presence of a tumor which is rarely observed in the normal location of the pylorus in health. It is more likely to be near the umbilicus but may be found much lower. The reason for this displacement is that the weight of the tumor drags the stomach downward. The tumor varies in size and in consistency and may not be nodular, it may be either fixed or movable; a pyloric growth is not likely to change its position on respiration but the contrary is true of tumors upon the curvatures. At times when situated over the aorta the tumor may seem to pulsate, but this pulsation is *non-expansile*. It is not very unusual for no tumor to be palpable even in the latest stages of the disease.

As the disease progresses the vomiting usually becomes more distressing. The vomitus consists of food particles and at times contains blood or "coffee-ground" material—the result of the admixture of the gastric secretion and blood; it may be of foul odor and if particles of food are detected which have been eaten a number of hours previously, we may, in the presence of other suggestive symptoms, diagnose a malignant pyloric stenosis. Often the amount of blood is so small that it is not apparent to the eye. Having excluded other sources of bleeding and no meat having been ingested the presence of blood should be tested for. Occult blood is best determined by the test proposed by Teichmann. Fæces and crystals of sodium chloride are mixed on a glass slide and covered with a coverglass. A drop of glacial acetic acid is allowed to pass into the mixture. It is then heated over a flame and the evaporated acid replaced drop by drop, until the fluid becomes dark brown.

The residue is evaporated in the air and if blood be present crystals of hæmatin hydrochloride are found on microscopic examination. Vomiting is less frequent when the growth is situated in portions of the organ other than the pyloric region. In the later stages there may be lymphatic enlargements in the clavicular and inguinal regions, enlargement of the liver, jaundice, cedema of the lower limbs, and an irregular febrile movement. Albumin may be present in the urine, and the presence of metastatic growths, particularly in the liver, may be detected. Blood examination shows a diminution in the red cells, seldom, however, below two millions, and a corresponding decrease in hæmoglobin; the hæmoglobin index is low, a point which is of assistance in the differential diagnosis from pernicious anemia. The white blood cells are, as a rule, increased to a moderate degree—twenty thousand or thereabouts—the increase being confined primarily to the polymorphonuclear neutrophils. In advanced stages of the disease nucleated red cells and myelocytes have been observed.

Diagnosis. *From the Stomach Contents.* Chemical examination of the gastric contents withdrawn after a test-meal reveals an almost total or an entire absence of free hydrochloric acid and an excess of lactic acid (Boas's sign). While absence of free hydrochloric acid and an excess of lactic acid may occur in other lesions, if repeated gastric analyses after test-meals show these conditions to be constantly present and the clinical symptoms point toward malignant neoplasm, the probability is strongly in favor of the existence of gastric cancer. The microscope should always be employed in the examination of the result of the test-meal and the significant findings are blood, especially occult blood, as determined by the Teichmann, the alouinturpentine or the guaiac-dioxide reactions, the Boas-Oppler bacillus and fragments of the growth. The Boas-Oppler bacillus is said to be present in gastric cancer almost without exception, and if a piece of the tumor can be demonstrated to be carcinomatous tissue the diagnosis is established beyond doubt.

The hæmolytic serum test of Kelling may also be useful in diagnosis.

Röntgen ray examination may reveal the presence of a tumor in certain patients, but this means of diagnosis is as yet hardly trustworthy.

From the Symptoms. Cancer usually occurs in elderly persons, the pain is but little changed by food, is often radiating, paroxysmal and severe, but never entirely absent; dyspeptic symptoms are constant, vomiting frequent, the hæmorrhage rather small in quantity but characteristic. The bowels are usually constipated and evidence of blood often is found in the fæces. There is evident cachexia.

Cancer in the stomach must also be distinguished from cancer in other organs as the pancreas, duodenum, omentum, left lobe of the liver, transverse colon, and from aneurysm of the abdominal aorta. These require careful weighing of the symptoms and thorough physical examination and,

inasmuch as many complications are present, hard and fast rules may mislead.

Prognosis. This is distinctly unfavorable, medical treatment offering no hope. Radical surgical intervention, early in the course of the disease, may be attended with good results, but the diagnosis can seldom be made before surrounding structures are involved, rendering entire removal of the malignant neoplasm impossible. The disease is usually fatal within a year, but under surgical treatment this period may be slightly lengthened.

Treatment. Medical treatment is merely palliative and consists in relieving the pain, improving the digestion, and keeping up the patient's nutrition. By attention to these factors life may be prolonged and made more comfortable.

The pain may be controlled by means of hot or cold applications to the epigastrium. When it is apparently due to retained and fermenting food it may be effectually relieved by gastric lavage and removal of the exciting cause. Sodium chlorate, in thirty grain (2.0) doses well diluted, thrice daily generally relieves pain. The methyl ester of amido-oxybenzoic acid (orthoform) in doses of from eight to fifteen grains (0.5 to 1.0) twice daily will often relieve the pain. It should not be used at the same time as bismuth subnitrate, silver nitrate or antipyrine with which it is incompatible. The narcotics should be used with care; extract of belladonna, one-sixth of a grain (0.01), may prove effectual, and codeine may be employed; hydrated chloral should rarely be used because of its liability to cause heart weakness; morphine sulphate may be given hypodermatically when all else fails.

The appetite may be improved by the administration of various stomachics. Of these condurango has been exploited as a specific in gastric cancer. While exerting no effect upon the course of the disease it does increase the appetite and aid digestion. It may be given with hydrochloric acid which also acts as a tonic upon the organ, in the following formula: \mathcal{R} fluidextracti condurango, \mathfrak{J} ii (60.0); strychninæ sulphatis, gr. $\frac{1}{2}$ (0.02); acidi hydrochloridi diluti \mathfrak{J} iv (15.0); fluidextracti gentianæ q. s. ad \mathfrak{J} iv (120.0). *Misce et signa*, one teaspoonful (4.0) in a wine-glass (60.0) of water through a tube, after meals. Lavage with plain water or with infusions of the vegetable bitters cleanses the stomach and acts favorably upon the appetite.

Vomiting may be controlled by lavage since it is frequently due to the stagnation and decomposition of food in the stomach. When the vomitus is of foul odor washing the organ with various antiseptic solutions such as those suggested under the lavage treatment of chronic gastritis (*see p. 373*) is indicated. Other means of relieving nausea and vomiting are bits of cracked ice in the mouth, sips of iced champagne, carbonic water, tincture of iodine, cold applications to the epigastrium, and hypodermatic injections of morphine. If the vomiting persists the patient should be fed exclusively *per rectum* for a few days.



198.

Chokolada

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For the treatment of *hæmatemesis* reference should be made to page 394.

Constipation is not infrequent and is better treated dietetically and by means of enemata of water or oil, or suppositories, than by means of purgatives. In persistent instances, we may, however, employ the milder laxatives, such as *rhamnus purshiana*, rhubarb or aloes, singly or in combination. Their depleting effect should contra-indicate the salines and the purgative waters.

Diarrhœa may be combated by means of phenyl salicylate (salol), bis-muth subsalicylate or subgallate, beta-naphthol bismuth (orphenol), and other intestinal antiseptics. Stomach lavage is often effectual in preventing diarrhœa, since it removes the cause, the fermented and decomposed contents of the dilated stomach.

The anæmia and cachexia necessitate the administration of the preparations of iron and arsenic, the latter of especial value, and the exhibition of heart stimulants, particularly strychnine, may be necessary.

In instances of carcinoma with obstruction at the œsophageal entrance the passage of a bougie from time to time will keep the passage clear, but great care must be excised. Potassium iodide and arsenic are said to delay closure in such patients. When swallowing becomes impossible the patient must be fed through the tube or a gastric fistula must be made.

Diet is the most important factor in the management of gastric cancer and unfortunately no suitable diet list can be laid down as applicable to all. Each patient must be studied by himself. The food allowed should be easily digestible, finely divided and as concentrated as possible. The patient should be consulted as to what foods attract him and what disagree with him and, while carbohydrates, fats and proteids may be allowed when there is no obstruction or fermentation, if these are present, the diet should be chiefly of proteid. It is usually best to prescribe small meals at frequent intervals, especially if there is motor insufficiency. Milk in small amounts at a time may be given if it is well borne; peptonized milk, the fermented milks, kumyss, matzoon and kefir, often are preferred by the patient; all meats and fish should be eaten minced and in small amounts only, at a time. The green vegetables, cereals, purée soups, stewed fruits, toast and zwieback are allowable as are also cocoa, chocolate, especially von Mehring's "Kraft-chocolade," tea and coffee. Alcoholic drinks such as beer, which are likely to ferment in the stomach, should not be taken, but the light wines may be permitted. The artificial substitutes for meat may be given but they are merely makeshifts; of these the best are probably nutrose and somatose.

Surgical treatment affords the only hope of complete recovery from gastric cancer and this may be brought about only when operative interference is undertaken in the early stages. The operation consists in complete removal of the tumor and is most likely to prove successful when this is situated at the pylorus. When the disease has progressed so far that removal of the

neoplasm in its entirety is impossible, a gastro-enterostomy permits free exit of the stomach contents into the intestine and prolongs the patient's life. He may even gain flesh for a time following this procedure.

Certain authors believe that in all patients, in whom the diagnosis of gastric cancer cannot be ruled out, an exploratory laparotomy is indicated and that even benign pyloric strictures should be excised.

HÆMATEMESIS.

The vomiting of blood is a symptom of various morbid conditions of the stomach and has been discussed at length in the sections devoted to the different affections in which it occurs. It results from the rupture into the viscus of blood-vessels in its walls, from the regurgitation of blood from the intestine, or from the swallowing of blood—later to be vomited—which has been extravasated from vessels of the nose, pharynx, or œsophagus. That blood may be raised from the respiratory tract, swallowed and finally vomited must not be forgotten.

Hæmatemesis occurs in injuries of the stomach, either from outside traumatism or as a result of the ingestion of caustic substances, in neoplasms of the organ, in diseases of the organ, such as gastritis of any kind, ulcer, etc., in diseases of other organs, notably hepatic cirrhosis, in malignant forms of the infectious diseases, yellow fever, smallpox, etc., and in constitutional diseases such as purpura, hæmophilia, and pernicious anæmia. Vomiting of blood has been observed after the rupture of aneurysms into the œsophagus.

The condition of the blood vomited depends upon the length of time which it has remained in the stomach. If fresh it may be bright in color and otherwise little changed. If it has been subjected to the action of the gastric juice it is likely to be dark and may be of "coffee-ground" appearance. The differentiation of hæmatemesis from hæmoptysis may generally be made on the following points: Vomited blood is usually dark in color, not frothy, and often is acid in reaction, while blood from the respiratory tract is light red or pinkish, is likely to contain an admixture of air and is consequently frothy, and is alkaline in reaction. In hæmoptysis the stools are not "tarry," while in gastric hæmorrhage the blood which has passed through the pylorus appears in the stools, imparting to them a black color.

Symptoms. These are those of loss of blood from any other part, *vis.* paleness, prostration, rapid, feeble pulse, subnormal temperature, air-hunger, depression, faintness, and a cold clammy skin. Fortunately death, from this cause primarily, seldom occurs.

Treatment. This is by absolute rest and the application of an ice coil to the epigastrium. Cracked ice is allowed by some authorities, while others insist that nothing should be given by the mouth. If the hæmorrhage has been considerable a tube should be very carefully introduced. For this a skilled hand is necessary, for the tube must be passed only a very

short distance beyond the cardia. A pint (500.0) of water at 120° F. (48.9° C.) is now introduced and allowed to remain. Later the clots should be siphoned out so as to allow the organ to contract, and a small amount of water containing about ten grains (0.65) of heavy magnesia is put into the stomach and allowed to remain. Lavage of the stomach with ice water has given good results in a few patients, according to Ewald. The hypodermatic use of morphine sulphate in dosage of one-fourth of a grain (0.015) will quiet the patient, relieve the air-hunger, and stimulate the heart action. Ergotole, twenty to thirty minims (1.20 to 2.00), hypodermatically, is recommended by Hemmeter as an excellent hæmostatic. Certain authorities mention hydrastis, hamamelis, lead acetate, iron chloride, and other hæmostatic drugs in this connection, but it is probable that the irritation caused by their entrance into the stomach more than counteracts their power over the hæmorrhage. Adrenalin chloride in doses of from ten to thirty drops (0.65 to 2.00) of the one to one thousand solution given in a drachm (4.00) of water has seemed to act well in certain instances of gastric hæmorrhage and it will be interesting to observe the results of its administration under the skin.

Excessive gastric hæmorrhage with its accompanying symptoms of heart weakness, pallor, and general collapse calls for immediate and energetic treatment. The usual means employed in hæmorrhage from any source must be instituted at once. Hypodermatic stimulation by means of camphor and ether or camphor in olive oil, strychnine sulphate, etc., is indicated. The so-called bleeding of the patient into his own tissues which consists in applying snug bandages to the limbs and thus forcing the blood into the trunk, is an excellent resource as is the administration of copious high rectal enemata of normal (0.9 percent.) solution of sodium chloride, at a temperature of 105° to 112° F. (40.4° to 44.5° C.). Intravenous infusion of saline, or, what may be much more rapidly performed, the giving of the solution under the skin of the fleshy parts of the back, chest, or thighs may be advised. For this procedure the only necessary apparatus is a fair sized aspirating needle, a few feet of rubber tube and a funnel. The funnel is filled, the solution allowed to flow through the tube and the needle, and the last is plunged into the subcutaneous tissue of the part selected. If the part is massaged as the fluid is flowing in a pint (500.0) or more of the solution may be given.

A necessary precaution in connection with this as with other methods of stimulation is to take care lest the vascular tension be raised to such an extent as to excite further hæmorrhage and thus defeat our object. The tension should be allowed to remain low lest this accident take place.

STENOSIS OF THE PYLORUS.

Definition. A condition characterized by hypertrophy of the muscular coat of the stomach at the pyloric orifice and usually accompanied by spasm and interference with the passage of stomach contents into the duodenum.

This definition does not include stenosis due to malignant or other disease.

Ætiology. The ætiology of the congenital form is unknown; the acquired variety is rarely seen before middle age and our knowledge of the causation of it is limited. It may occur as a result of a congenital abnormality but more frequently appears to be due to a chronic inflammatory condition of the stomach. The disease is a rare one.

Pathology. In the congenital type the muscularis of the entire stomach is the seat of some degree of hyperplasia, but especially is this the case at the pylorus; here the gastric wall is firm to the feel and dense in texture. The chief seat of the hypertrophy is the layer of circular fibres, the longitudinal seldom being much involved. The stomach itself may be contracted, the so-called benign sclerosis of the stomach and the pyloric hypertrophy may extend to some extent throughout the remainder of the muscularis.

Dilatation of the organ is unusual.

In the acquired variety of this condition, when the hypertrophied tissue is limited in extent to the pyloric region, there is likely to be dilatation; when there is general thickening of the muscular coat contraction of the organ is more common.

Symptoms. Congenital pyloric stenosis is evidenced by frequent and persistent vomiting without assignable cause. The vomiting may occur directly after the ingestion of food or an hour or more later, and the fact that no bile is found in the vomitus is significant. Rarely is a tumor palpable. The patient rapidly becomes emaciated and death may follow within three or four months.

In adults the principal symptom is gastric pain with a sense of fullness and pressure. If there is co-existent dilatation and muscular atony, emesis may occur. A palpable tumor may or may not be present, but the thickened pylorus which may suggest an ulcer which has become carcinomatous is usually distinguishable by the skilled observer, especially in thin subjects, and fortunately, for accuracy of diagnosis, these patients usually are ill-nourished, although true cachexia is not a feature of the condition. This fact, together with the rarity of the disease and its freedom from hæmatemesis, is a useful point in the differentiation from malignant disease. The prognosis as to recovery without operation is, in both types of this disease, bad.

Treatment. The palliative treatment of the congenital form consists of lavage to remove retained food and to prevent vomiting. Feeding through the tube may relieve that form of reflex vomiting which sometimes results from the mere act of deglutition. Surgical intervention in pyloric stenosis offers the only hope of recovery. The operations applicable are gastro-enterostomy, pyloroplasty, and excision of the pylorus. Loreta's operation (manual dilatation of the pyloric orifice) is not advised.

In adults the treatment, aside from surgical interference, is that of the causative chronic gastritis (*see p. 372 and following*).

Ch
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Acute inflammation of the Stomach

by Robert Coleman Kemp

Chronic Form of Surgery

Nov. + Dec 1908

Ch

Ac. Dil. of Stomach with

Influence of Duodenal Obstruction

Lewis A. Connor

Chronic Gastritis 1907 Vol
1:2 p. 345

ACUTE GASTRIC DILATATION.

Synonym. Acute Gastrectasis.

Definition. An acute, rapid dilatation of the stomach.

Ætiology. Various causes are said to bring about this rare condition; certain instances appear to be idiopathic, others take place as a result of some influence on the nervous system, producing a paralysis of the nerves of the organ in question. Acute dilatation may occur during the infectious diseases, pneumonia, meningitis or peritonitis; as a result of acute obstruction of the pylorus, as from a foreign body; after parturition, abdominal operations, or anæsthesia, where it has been thought to be due to the swallowing of anæsthetic-impregnated mucus from the throat. Constriction of the duodenum by the superior mesenteric vessels has been considered a factor in its causation, and it may follow the rapid consumption of very large amounts of food and drink.

Pathology. After death the wall of the stomach is thin, its cavity is large, and its greater curvature may extend far below the umbilicus. The viscus contains gas, fluid which is usually watery and of a greenish tinge, rarely it is thick and brownish, and perhaps undigested food.

There may be drops of blood upon the lining of the organ and the blood-vessels are dilated.

Symptoms. The onset of the condition is usually sudden, although after operations it may not appear for a day or two. There is usually considerable pain and the thirst is marked. The abdomen is greatly distended and violent vomiting is present as a rule, the vomitus being thin and tinged with green or brown. The outline of the stomach is often plainly apparent but peristalsis is seldom visible. There is no rigidity of the abdominal wall. The constitutional symptoms are those of great depression, with subnormal temperature, rapid, weak pulse and rapid and shallow respiration and cyanosis. The absence of fever enables us to exclude a post-operative peritonitis. Death may take place in collapse.

Prognosis. This is bad but many instances do not terminate fatally.

Treatment. Prophylaxis consists in washing out the stomach if there is marked vomiting after anæsthesia. Since the condition may be the result of the absorption of toxic substances from the stomach this organ should be subjected to frequent lavage, and the intestine should be cleared by means of high irrigations. Rest from the work of digestion is advisable, consequently rectal alimentation should be undertaken, and as relapses may occur even after several days, food and drink by mouth should be given with the utmost caution. As soon as the condition of the stomach will allow, small doses of calomel or of a saline should be given and frequently repeated.

The constitutional depression should be combated by means of hypoder-

matic stimulation—especially strychnine and atropine—hot applications to the extremities, hypodermatoclysis, etc.

CHRONIC GASTRIC DILATATION.

Synonym. Chronic Gastrectasis.

Definition. A condition of the stomach in which its capacity is increased.

Ætiology. In the causation of gastric dilatation two factors must be taken into account. 1. Atony of the musculature of the organ due to frequent distention by excessive quantities of food or drink, to inflammatory interference with the nourishment of the stomach, as in chronic gastritis, and to various constitutional diseases which lower the tone of the muscular system in general, such as the acute infectious diseases, pulmonary tuberculosis, various nervous diseases, the anæmias, diseases of the heart, liver or kidneys, etc. 2. Dilatation due to pyloric obstruction caused by malignant growths, hypertrophy or thickening of the gastric wall at this situation, contraction of cicatrices following ulcers, traumatism, etc., and pressure from without of adhesions, abdominal tumors or misplaced viscera, or the habitual wearing of over-tight corsets. The disease is one of adult life, though it has been met in children.

Pathology. The capacity of the organ may be increased to three or four times the normal, which is a little over a quart (litre). Its lower border is, in consequence, markedly displaced downward. There is atrophy of all the coats and the wall is often thinned as a result of the stretching which it has undergone, while at times there may be thickening due to the replacement of the normal structure with connective tissue.

Symptoms. These are a sense of weight in the epigastrium, especially after a full meal, eructations of gas often mixed with liquid or food particles, and nausea, which at times is followed by emesis. The vomitus is frequently of large amount and may be seen to contain bits of food which have been ingested a number of days previously. The appetite may be good or poor and there is always thirst; the last is so pronounced that its presence should always lead to a careful physical examination in the stomach. The bowels are usually constipated and the urine is often scanty, highly colored, and loaded with urates.

As the disease progresses the patient becomes anæmic, weak and emaciated. A condition known as gastric tetany may develop as a result of absorption of the toxins generated by the decomposition of the stagnant food retained in the stomach. The tetanic convulsions follow premonitory sensations of drowsiness, tingling of the extremities and sometimes vomiting. The movements affect both sides of the body, one, usually, less than the other, involve chiefly the muscles of the limbs and face and are accompanied by pain. Death from exhaustion and preceded by loss of consciousness is a consequence which occurs in about seventy-five percent. of patients.



Diagnosis. *Physical Signs.* *Inspection* in thin patients, particularly if the stomach is distended with food or gas, may reveal the greater curvature even several inches below its normal level (one and one-half to two inches above the umbilicus), and in marked instances the line of the lesser curvature may be demonstrable. Peristaltic movements from right to left may be observed to stop at the pyloric region where a prominence due to a tumor may be visible. If the organ is artificially distended by gas, resulting from the administration of one-half of a drachm (2.0) of tartaric acid in a little water and two drachms (8.0) of sodium bicarbonate, also in water, given separately, or by inflating with a bicycle pump through an ordinary stomach tube, the examination will be greatly facilitated. One must be careful however to exclude the possibility of ulcer before employing these procedures.

Palpation enables us to feel what we have hitherto seen and even when not visible, the border of the stomach may be demonstrated by this means. A palpable tumor may be made out and peristalsis also may be felt. Light pressure quickly made and as quickly released may bring out splashing sounds which may be distinctly audible to the lower limit of the organ. These sounds are more easily obtained and more plainly heard than over the normal stomach.

Percussion plainly evidences the borders of the enlarged organ, the note over it being tympanitic in character when the patient is recumbent; when he is upright it is flat in its lower part owing to the fluid or food in its most dependent portion; distention of the stomach by water and of the colon by air or *vice versa* may aid the observer in mapping out the borders of the organ.

The use of the stiff sound may show the greater curvature to be at a lower level than normal, and its extremity may be palpable through a thin abdominal wall.

The *gastrodiaphane*, an instrument constructed to illuminate the stomach by electric light, may be employed. This, in a word, consists of a small incandescent lamp at the extremity of a stomach tube and when passed into the organ aids in determining its size and position. The examination must take place in a dark room. When the stomach is filled with a fluorescent medium the value of this method of examination is much enhanced. Also bismuth subnitrate in dose of two drachms (8.0) may be administered and the patient subjected to a fluoroscopic examination ten minutes later. The most accurate method of all is a skiagraph, likewise taken after the ingestion of bismuth subnitrate, which will demonstrate the gastric enlargement.

The administration of certain drugs which are not absorbed from the stomach and, which after passing the pylorus, are excreted in the urine is another means of testing the gastric motility and the patency of the pylorus. In this connection phenyl salicylate (salol) may be employed. Normally salicyluric acid should be present in the urine within five or six hours after its

administration. Urine containing this acid takes on a port wine color upon the addition of a small quantity of the tincture of iron chloride.

Stomach Contents. The organ should be washed on the evening before the test-meal is given in order to remove its decomposing and stagnant contents. The examination of a test-meal withdrawn an hour after its ingestion gives evidence of delayed and imperfect digestion and if cancer is present there will usually be absence of free hydrochloric acid and presence of lactic acid and the Boas-Oppler bacillus, otherwise the content of free hydrochloric acid is variable. Numerous organisms, yeasts, sarcinæ and other bacteria, are usually present in large numbers and butyric and acetic acids may be found.

Treatment. The medicinal treatment of this condition consists in administering drugs calculated to improve the muscular tone of the stomach and to lessen the tendency to decomposition of the retained food. As a muscle tonic strychnine is most valuable. It may be given alone or in combination with physostigma—strychnine sulphate, one-twentieth of a grain (0.003) and extract of physostigma, one-sixth of a grain (0.01) three times a day. If the hydrochloric acid is diminished in quantity the ditute acid should be prescribed; this substance is also useful in neutralizing the gastric fermentation. Hyperacidity may be neutralized by heavy magnesia, ten grains (0.65), bismuth subcarbonate and sodium bicarbonate, of each, five grains (0.30) given about an hour after meals, and fermentation may be retarded by the following formulæ. \mathcal{R} resorcinolis, gra. lxxv (5.0); bismuthi subsalicylatis, pulveris rhei, sodii sulphatis āā \mathfrak{Z} iiss (10.0); sacchari lactis \mathfrak{Z} iiss (14.0); Misce et signa, one-half of a teaspoonful (2.0) twice a day (Ewald). Pancreatin may be used in patients which do not bear hydrochloric acid well, and creosote and guaiacol are recommended—five minims (0.30) in capsules—as antifermentatives.

Lavage usually will relieve the vomiting and at the same time is an important adjunct to the treatment, since by this means we may remove the decomposing contents of the stomach. The addition to the wash water of antiseptics (see p. 373) is often advisable.

Constipation is frequent, the intestine being often atonic as well as the stomach. Purgatives should never be given, but a movement of the bowels should be secured daily by diet regulation. A glass or two of cold water on rising and the ingestion of stewed fruits, green vegetables, graham or whole wheat bread, together with proper abdominal massage and electricity, usually suffice in this regard. Intestinal irrigations may be given from time to time. If laxatives are absolutely necessary rhamnus purshiana (cascara) is the least objectionable.

Massage and electricity are necessary, the former being employed only when the stagnant contents of the stomach has been removed and the latter, the intragastric faradic current especially, is to be given as described on page 375.

The tonic effect of hydrotherapeutic procedures, especially the cold morning sponge, is not to be overlooked, and the fact that properly fitting abdominal binders can do much toward supporting the prolapsed and enlarged organ must not be ignored. The best of these is the adhesive plaster bandage devised by Rose.

Diet. The patient must be warned not to eat or drink large quantities at a time, but should be advised that four to five small meals per day are preferable to three large ones and that he must avoid all foods likely to cause fermentation—especially fats and sweets. Liquids should be restricted to a quantity not greater than three pints (1500.0) during the twenty-four hours. If thirst is troublesome further fluids may be given *per rectum*.

The conditions revealed by repeated gastric analysis will demonstrate the diet applicable to each particular case. With plenty of free hydrochloric acid the red meats may be allowed, also cereals, gruels, eggs, and vegetables which last must be mashed or better given in purée form; the carbohydrates aside from those above mentioned must be restricted. When the free hydrochloric acid is abnormally small in amount more carbohydrates may be taken but the animal proteid element of the diet should be restricted to the white meats, fish, calves' thymus, etc.

Alcoholic drinks are best omitted, but when a light sweet or sour wine seems to benefit the patient it may be allowed in small quantity—two sherry glasses as each meal, for instance.

Surgical Treatment. For patients who continue unrelieved despite medical treatment the question of surgical intervention must be considered. Where the dilatation and atony are due to pyloric obstruction pyloroplasty, pylorotomy or gastro-enterostomy is applicable, depending upon the conditions which confront us.

A dilatation depending merely upon atony of the gastric musculature may be relieved by a gastro-enterostomy or by gastroplication. Both physician and patient, however, must not lose sight of the fact that none of these operative procedures is by any means certain to bring about complete relief and that the adhesions and other factors that are likely to follow a laparotomy may render the discomfort of the patient but little, if any, less than before he entered the surgeon's hands.

HOOR-GLASS OR BILOCULAR STOMACH.

Definition. A condition in which the stomach is divided by a constriction into two parts, more or less equal in size. It is a rare state and still more rarely is the organ separated into three or more sacs.

Ætiology. The bilocular stomach may be congenital—though this statement is refuted by some authorities—or acquired. The latter form is

usually the result of the cicatricial contraction of ulcers or erosions from the ingestion of corrosive substances, more seldom is it due to outside adhesions or malignant growths. The theory has been advanced that it may follow tight lacing or ill-fitting corsets. In men the wearing of belts is believed to cause this condition. There is said to be at times a contraction of the gastric musculature at the seat of the constriction.

Pathology. The organ presents a sacculated appearance and at the constriction the muscle fibres may be thickened. This is by no means always the case for the narrowest part of the organ may be devoid of muscular tissue and consist of a fibrous cicatrix.

Symptoms. Moderate degrees of hour-glass stomach often cause no characteristic symptoms. When marked, this condition is said by a French author to be the cause of the "peculiar sounds heard about fair mortal's equatorial zone." There is usually more or less discomfort referred to the organ, which at times may be increased, due to spasm of the hypertrophied muscle fibers about the constriction. The fact that the gastric muscle must force the ingesta over and through the constriction finally gives rise to an atonic condition which is likely to result in dilatation. Diagnosis without physical examination is impossible and fortunately the condition is accompanied by a number of unmistakable signs. When the stomach seems empty and the tube has been passed with no result palpation may elicit a splashing sound, due to the fact that the pyloric sac of the organ contains fluid while the cardiac sac is truly jejune. At times during lavage the reflux will be found to exceed the influx in quantity. Distention of the organ by air may, in thin subjects, reveal the constriction with a dilatation upon either side. When this sign cannot be seen the borders of the stomach may be palpable and the condition thus made out. The two portions of a Seidlitz powder given separately by their evolution of gas will distend the cardiac sac at once while the pyloric sac may not be distended at all or may be seen to slowly enlarge as the gas enters it through the constriction. The use of the Röntgen-ray after the ingestion of bismuth will make the diagnosis clear in most instances, and Hemmeter's rubber bag when inflated in the stomach reveals a distention of the cardiac pouch only. A skilled manipulator may succeed in passing a tube through the constriction and obtaining contents from the pyloric pouch which differs materially on chemical analysis from that previously obtained from the cardiac sac.

Prognosis. Long standing instances of this condition lose flesh and strength, lack proper nutrition and may terminate fatally.

Treatment. Aside from relieving the symptoms, this is purely surgical and consists in the performance of a plastic operation at the site of the constriction or of a gastro-enterostomy to bring about a communication between both sacs and the intestine.

VISCEROPTOSIS.

Synonyms. Glénard's Disease; Splanchnoptosis; Enteroptosis; Gastrop-tosis.

Definition. A condition characterized by a falling of the abdominal viscera to a level lower than the normal and due to a relaxed state or stretching of the mesenteries and peritonæal ligaments combined with relaxation of the muscular wall of the abdomen. The ptosis may involve the liver, spleen, stomach, intestines and kidneys.

Ætiology. This condition is more common in women in the proportion of about three to one, this fact probably being due less to the wearing of over-tight and ill-fitting corsets, than to the extraordinary stretching of the abdominal wall attendant upon pregnancy. The loss of muscular tone and of fat resulting from prolonged inflammations of the alimentary tract, from the wasting diseases, excessive loss of blood, etc., and over-exertion predispose to downward displacements of the abdominal viscera. Glénard's original hypothesis, that a dislocation of the hepatic flexure of the colon was caused by a stagnation of faecal matter as the beginning of a general ptosis, is probably less correct than the theory that the condition is due to factors such as those mentioned above. Of late the idea has been advanced that there may be a congenital predisposition to visceroptosis since in the foetus and even in the newly-born child the viscera may occupy an analogous position in the abdominal cavity.

The fact that the displacement may not involve all the abdominal organs must not be overlooked, for it is not unusual to find a kidney, the stomach, the liver or the spleen in abnormal locations.

Symptoms. These are indefinite and indeed the condition may exist without causing any symptoms whatever. In general, however, the patient complains of various dyspeptic symptoms, such as poor appetite, sensations of distention and weight and eructations and rumblings in the digestive tract. Rarely the appetite may be increased; the bowels are usually constipated, though the opposite condition may be present. The breath may be foul, the tongue coated and the mouth dry. Nervous manifestations, such as dizziness, depression of spirits, headache, sleeplessness, palpitation, and tingling and sensations of cold in hands and feet are frequent. Considerable bodily emaciation is not rare. A chlorotic condition of the blood is frequent.

Physical examination made with the patient standing reveals an abdomen prominent and baggy in its lower part, relaxed and thin of wall. On palpation the abdomen has a characteristic doughy feeling and splashing sounds may be easily elicited. The edge of the liver, when this organ is displaced, may be felt lower than normal, the kidneys, especially the right, and spleen may be palpated. Percussion of the liver shows that it is either

rotated upon its horizontal axis or its upper limit is displaced downward. The displacement of the stomach may be demonstrated by any of the means described under gastric dilatation (*see* p. 398 and following) and it may be shown to be in a position more vertical than normal, its cardiac end usually being in the normal situation and the pylorus far from its proper site. The examination should be repeated in all of its particulars with the patient lying down so that of the amount of displacement of each organ can be properly estimated. The tenth rib may be movable (Stillier's sign).

Treatment. Drugs have no great part in the management of this condition, the principal object being to replace the abnormally situated viscera and to maintain them in their normal position. This may best be done by putting the patient in bed, keeping him there and fattening him. He should be overfed and as adjuvants to this treatment faradic electricity and the high frequency current may be employed. Physostigmine salicylate in doses of one one-hundredth of a grain (0.0006) three times a day is useful to restore the tone of the intestinal musculature. This may be given alone or in combination with strychnine sulphate one-twentieth to one-thirtieth of a grain (0.003 to 0.0025) and capsicum, one grain (0.065). A two pound (1000.) cannon-ball covered with leather, rolled over the abdomen, over the large intestine and following the direction which the fæces take, the patient lying in bed, for ten minutes each day will often increase muscular tone and relieve the constipation.

The bowels should be kept open by means of vegetable laxatives such as aloes or rhamnus purshiana if necessary, but the diet should be depended upon to regulate this function in so far as possible; fruits and foods leaving an undigested residue being particularly indicated. When diarrhœa is present it may be controlled by intestinal antiseptics such as bismuth sub-salicylate, resorcinol or benzo-naphthol, and when gastric analysis shows hydrochloric acid to be diminished in quantity this substance may be supplied.

When the cure by means of rest in bed is inconvenient or impossible the patient may receive much relief from wearing a properly fitting corset, such as has been devised and popularized by Gallant, and can now be readily obtained. The patient should be taught by his physician how to replace the viscera and this should be done in bed each morning and the corset applied before the erect position is assumed.

As a substitute for the corset, strapping with zinc oxide adhesive plaster (preferably spread on moleskin strips) have been suggested and often achieves excellent results (Rose).

It should hardly be necessary to state that tight lacing of ill-fitting corsets is contra-indicated in ptosis of the viscera and that women should be advised to wear skirts suspended from the shoulders rather than from the hips.

Physical methods such as massage, either by the physician or the patient himself, moderate exercise, such as bicycling, golf, etc., and hydropathic pro-

1 in order

cedures have a place in the management of this condition after the rest cure has succeeded in restoring the organs to their normal situations.

The dietetic treatment of visceroptosis offers difficulties. The problem in hand is to fatten an individual whose powers of digestion and assimilation are impaired and to over-feed such a patient without disturbing his already poor digestive ability is not an easy task. And again the difficulty is enhanced by the fact that the regimen for each patient must be chosen with reference to his particular capabilities. During the early part of the rest cure a milk diet should be instituted if the patient can digest and is satisfied with it, later more latitude may be allowed and, if the digestive powers permit, a general diet should be prescribed.

If the patient is not undergoing the rest cure and is up and about he should not eat large quantities at a time lest the stomach become over-distended and the ptosis accentuated; here four or five small meals per day of concentrated food stuffs are preferable to three of large or ordinary size. Fats may be eaten if they can be digested. Gastric analysis and observation of the patient in hand will indicate far better the proper diet than can any list of food articles arbitrarily set down.

Surgical measures, such as anchoring the liver, fixing the kidneys, taking reefs in the lengthened mesenteries, suturing the lesser curvature of the stomach or its anterior wall to the anterior parietes of the abdomen and suturing the edges of the recti abdominales muscles together after having removed the intervening tissues, have been employed with varying results.

NEUROSES OF THE STOMACH.

A. SECRETORY NEUROSES.

HYPERCHLORHYDRIA.

Synonym. Gastric Hyperacidity.

Definition. Excessive secretion of hydrochloric acid by the gastric tubules occurs in various gastric disorders but there is a class of patients in which there is a hypersecretion of gastric juice which takes place in the absence of food or of any inflammatory condition. It exists in three chief forms.

(a) Paroxysmal hyperchlorhydria, the gastroxynsis of Rossbach.

(b) Continuous hyperchlorhydria. This is a chronic state and was first described by Reichmann as gastrosuccorrhœa.

(c) There has also been described a gastromyxorrhœa (Dauber) which may be intermittent or, more frequently, continuous.

Ætiology. Hyperchlorhydria has no distinct causative factor. It is most frequently observed in persons of neurotic temperament. It is more

common in the young and middle-aged and is often seen in chlorotic subjects; it is predisposed to by various mental influences such as grief, worry, etc. Some subjects are afflicted with it directly after eating or drinking certain substances. It is frequently found in the early stages of pulmonary tuberculosis.

Symptoms. These are practically identical in all the forms except that in the paroxysmal variety they appear intermittently while in the continuous type they are always present. The most prominent symptoms are pain referred to the stomach occurring one to three hours after eating, "heart burn," the eructation of gas, thirst and nausea. Vomiting is infrequent and when present the very acid taste of the vomitus is noticed. Headache is common. The appetite is usually good and the bowels are, as a rule, constipated. The acidity of the urine may be reduced owing to the excess of gastric acidity.

In the paroxysmal form of the disease the symptoms may last only a few hours or may be prolonged for a number of days to be terminated by treatment or in an attack of vomiting. In the continuous type the pain is more marked and, if unrelieved, the patient may lose flesh and strength. In long standing instances anæmia is not rare.

Diagnosis. This can be made certainly only by means of chemical analysis of the gastric contents. A test-meal removed two or three hours after ingestion will consist of a small amount of thoroughly digested food containing an excess—sometimes very large—of combined, and especially, free hydrochloric acid. If the stomach is washed and several hours later—nothing having been ingested in the meantime—the contents of the organ is expressed this will be found to consist chiefly of gastric juice, where normally none should be present.

Prognosis. As regards improvement this is very favorable and cures are not infrequent.

Treatment. The neutralization of the excessive acidity present in the stomach by means of the alkaline carbonates—sodium bicarbonate in particular—has its disadvantages, the resulting sodium chloride from the combination of sodium bicarbonate and hydrochloric acid being ready for formation into still more of the offending substance; however, certain observers claim that benefit results from the administration of considerable doses of sodium bicarbonate—ten to thirty grains (0.65 to 2.0)—after meals; a far preferable antacid, however, is heavy magnesia which results in the formation of magnesium chloride which acts as a laxative, which is usually desirable. Some clinicians prefer to give it with sodium bicarbonate, but it is better administered in a combination such as the following: \mathcal{R} *magnesii oxidi ponderosi*, gra. x (0.065); *pulveris rhei*, gra. v (0.30); *extracti belladonnæ*, gr. $\frac{1}{8}$ (0.018); to be taken one-half to one hour after each meal. Sodium bicarbonate in amount equal to that of the magnesia may rarely be added with benefit. Other useful formulæ are: \mathcal{R} *potassii carbonatis*, *magnesii*

• 12

oxidi ponderosi āā gra. xii (0.75); extracti belladonnæ gr. $\frac{3}{16}$ (0.018); sacchari lactis gra. xv (1.0). Misce et signa, to be taken about an hour after meals. R̄ sodii bicarbonatis, cretæ præparatæ, magnesi carbonatis, āā gra. iii (0.2). Misce et signa, to be taken after meals.

Belladonna is said to lessen the secretion of the gastric juice and it and atropine are also useful in combating the severe pain. This symptom may be rendered less distressing by various narcotic drugs as well, codeine and strontium, ammonium or sodium bromide being most frequently prescribed. Morphine should not be administered.

Pain which resists drug treatment may be relieved by gastric lavage, which removes the hyperacid contents of the stomach. To the last of the water used it is well to add sodium bicarbonate. Washing with a mixture containing bismuth subgallate and bismuth subcarbonate of each one drachm (4.0) to the quart (litre) of water is an excellent measure.

Intra-gastric sprays of silver nitrate solution, one to one thousand, are said to have the double effect of lessening the secretion and relieving the discomfort. Following this procedure the stomach should be washed with warm water.

The drinking of considerable quantities of Carlsbad water, natural or artificial, tends to lessen the production of hydrochloric acid by the stomach and in hypochlorhydria in purinæmic subjects the use of artificial effervescent solutions made according to the following formulæ is beneficial.

	A.	B.
Sodium bicarbonate. . .	gra. cxx (8.0).	gra. lxxv (5.0).
Sodium borate . . .	gra. xxx (2.0).	gra. xv (1.0).
Sodium salicylate . . .	gra. xxxvii (2.5).	gra. xxx (2.0).

Each of these mixtures is to be added to a quart (litre) of ordinary carbon dioxide water from a siphon. Before breakfast a half tumbler of solution A is to be taken; after meals a half tumbler of solution B should be drunk.

Constipation usually yields to the treatment directed at the neutralization of the acidity. If obstinate, the saline waters, abdominal massage, intestinal lavage and the preparation of rhubarb will prove effectual (*see* p. 406).

Electricity in the form of intra-gastric galvanism may be employed, the anode to be applied inside the stomach, which should be partially filled with lukewarm water, while the cathode is placed upon the epigastrium or back.

Diet. Certain clinicians advocate a diet consisting chiefly of proteid substances, since the albuminous foods combine with the excessive hydrochloric acid, while others consider much carbohydrate and little proteid to be better adapted to the gastric condition because the latter class of foods tends to cause increased hydrochloric acid secretion, but the proper method of deciding upon a suitable diet in these cases is to study each patient. It is

probably true, however, that more patients will do well upon a diet principally of proteid. Of the meats, beef, mutton, veal, pork, raw or cooked ham and fowl are allowable, as are eggs, Roquefort and Swiss cheese, cocoa and milk. Fats are not contra-indicated but it is generally considered that vegetables containing large amounts of starch are better omitted. Since the period of starch digestion is shortened, owing to the abnormally early secretion of hydrochloric acid after the ingestion of food in this condition, starchy foods should be eaten, when possible, dextrinized, toast, zweiback and the like being preferable to plain bread.

Coffee, beer or other alcoholics should be forbidden but the drinking of considerable quantities of alkaline waters with meals is permissible since by this means the excessive gastric juice is diluted.

All substances likely to increase the secretion of gastric juice, such as condiments, spices, fruits containing seeds or enveloped in skins, etc., should not be eaten and the food should be taken finely divided and neither very hot nor very cold. The patient should be advised to masticate thoroughly so that mouth-digestion may be as fully accomplished as possible. The chewing between meals of substances calculated to excite the secretion of saliva has been advocated with the idea that the swallowing of this secretion in large amounts tends to neutralize the gastric acidity, but is of slight value.

An attack of pain after the evening meal may be relieved by a glass of warm milk, a cup of broth containing an egg, a soft boiled egg, or some raw ham finely scraped. Any of these substances takes up a large quantity of hydrochloric acid.

The treatment of paroxysmal hyperchlorhydria consists in the employment during the attack of the means already suggested for chronic hyperacidity, together with gastric lavage and the application of a mustard paste or hot water bag to the epigastrium. Strontium bromide or ammonium bromide, one-half of a drachm (2.0) with half a drachm (2.0) of aromatic spirit of ammonia, three times a day will frequently shorten and lessen the frequency of the paroxysms. The general management of the condition consists in abstention from mental over-activity and in regulation of diet and exercise.

Alcohol, tobacco, coffee and all other stimulants should be interdicted and a life of recreation and free from care and worry should be ordered, and exercise out of doors—the bicycle, golf, tennis, riding, swimming, etc.—should be advised. Dietetically and otherwise the treatment may be carried out along the lines laid down for continuous hyperchlorhydria.

HYPOCHLORHYDRIA.

Definition. Hypochlorhydria, subacidity or hypochylia, is a condition of the stomach in which the gastric juice contains an abnormally small amount of hydrochloric acid and also of the digestive ferments.

Ætiology. It exists in various abnormalities of the organ, such as gastritis and cancer, in anæmic conditions, during the infectious diseases and in neurotic states; the subacidity of these last conditions, the true nervous hypochylia, occurs in hysteria, tabes dorsalis, etc. Entire absence of hydrochloric acid, which is denominated *achylia gastrica*, occurs in hysteria and neurasthenia, in carcinoma, and as a result of the atrophy of the gastric glands due to chronic inflammations.

Symptoms. These are diminution or entire absence of hydrochloric acid and gastric ferments but the condition may exist for long periods without causing complaint on the part of the patient; when, however, in addition to the secretory disturbance, the motor power of the organ is impaired, the consequent fermentation of stagnant food results in distention, eructations, sensations of weight and fullness and at times marked gastralgia. Diarrhoea may be present.

Diagnosis. This can be made only on chemical examination of the stomach contents withdrawn after a test-meal. This shows diminution or entire absence of both free and combined hydrochloric acid and of the gastric ferments. Lactic acid is rarely found in nervous hypoacidity.

Treatment. This of both hypochylia and achylia consists in the administration of dilute hydrochloric acid to supply the lack of this substance in the stomach. The dose should be regulated with regard to the amount present in the gastric secretion. When the acid is wholly absent as much as fifteen to twenty drops (1.0 to 1.30) may be given half hourly after meals until three doses have been taken. It must be plentifully diluted and taken through a tube. The administration of pepsin, pancreatin, and especially of fresh pineapple juice, which contains a digestive ferment, may supply the loss of the normal digestive ferments.

Loss of appetite may be relieved by basic orexin and by gastric lavage with solutions of the vegetable bitters such as gentian or quassia. In atony of the gastric musculature strychnine nitrate in large doses—one-thirtieth to one-twentieth of a grain (0.002 to 0.003) is indicated and this drug also exerts a favorable action upon any co-existent neurotic condition. Stagnated and decomposed food should be washed out and the stomach irrigated with a disinfectant solution (*see* p. 373); electricity and hydrotherapeutic procedures are useful adjuncts to the treatment.

The diet should be adapted to the digestive capabilities of each patient. Meat need not be interdicted, in fact it is better that the patient eat some meat, this should, however, be taken in a finely divided condition. Green vegetables and purée soups may be taken; fats in the form of cream and butter are allowable unless they cause fermentation. Salty substances such as anchovy paste, caviar, etc., taken before meals in small quantities, increase both the appetite and the gastric secretion.

B. MOTOR NEUROSES.**CARDIOSPASM.**

Synonym. Cramp of the Cardia.

Definition. This is a spasmodic contraction of the gastric musculature at the cardiac end of the stomach and is usually the result of some irritation such as hyperacidity, or distention of the stomach by air or gas. It also occurs as a symptom of neurasthenic and hysterical conditions and very rarely as a true neurosis of the motor system of the organ.

Varieties. It exists in an acute and in a chronic form; the former appears paroxysmally and lasts but a short time, the latter is a serious condition and one difficult of management. The acute variety, when occurring in an empty stomach, gives no symptoms; in a full stomach it produces a spasmodic and cramp-like pain which soon passes; if food or drink is taken during the cramp there may be obstruction to deglutition. In the chronic form the patient may also have difficulty in swallowing and feel that the food stops before entering the stomach. If he continues to eat the œsophagus gradually fills and finally the food is regurgitated little changed and containing no gastric juice. The inability of food to reach the stomach brings on a progressive emaciation which is likely to cause suspicion of carcinoma, and the accumulation of ingesta in the œsophagus may result in dilatation or diverticulum formation. There is likely to be obstruction to the passage of the stomach tube.

Treatment. This consists in the appropriate treatment of any co-existent inflammation or secretory disorder of the stomach. The food should be non-irritant, easily digestible and taken in finely divided form. In the severer grades of this condition a milk diet or feeding through the stomach tube may be necessary although it is stated that at times solids are more easily swallowed than liquids. Any constitutional neurotic condition should receive proper treatment. The insertion of a firm tube of good size through the cardiac orifice and allowing it to remain in place for a half hour at a time is an approved method of treatment. Before eating, the gastric mucosa at the cardia may be cocaineized by a small sponge fixed at the extremity of a stomach tube by means of a thread passed through the tube. The sponge should be saturated with a two to four percent. solution of cocaine hydrochloride, the tube passed as far as the cardia and the cocaine solution expressed by pulling the thread. An intra-gastric spray of solution of cocaine or cocaine and menthol may also be employed to produce anæsthesia. The use of the galvanic current is an excellent measure in chronic spasm; the anode is introduced into the cardia, the location of which has previously been ascertained by measurement, the cathode is applied to the back of the neck and a current of about twenty-five milliamperes is employed for ten



minutes; the anode is then placed over the stomach and the cathode within the cardia and the process repeated.

PYLOROSPASM.

Definition. This condition is analogous to cardiospasm, but takes place at the pyloric extremity of the stomach. It occurs in excessively acid states of the organ, accompanying gastric dilatation, as a result of the action of caustics, and as a concomitant of pyloric ulcer or cancer.

Symptom. The interference with the passage of stomach contents through the pylorus results in stagnation and fermentation and finally in dilatation with the accompanying symptoms of these conditions. In thin subjects the gastric peristalsis may be visible and in some instances reversed peristalsis with vomiting takes place.

Treatment. This consists in the exhibition of sedatives, such as the bromides, strontium bromide, fifteen to twenty grains (1.0 to 1.30), codeine phosphate, one-half a grain (0.03) or extract of belladonna, one-fourth of a grain (0.016) three times a day. Hydrated chloral may be used but is dangerous because of the possibility of establishing the habit. The spasm may be controlled by the intra-gastric cocaine spray, and intubation of the pylorus, allowing the tube to remain in place for about ten minutes, is recommended. The galvanic current may be used as described under the treatment of cardiospasm. All food which may irritate the stomach, and over-burdening the organ with large amounts of food should be avoided.

GASTRIC HYPERPERISTALSIS.

Synonym. Peristaltic Unrest.

Definition. This is a condition characterized by rapid and continuous contractions of the stomach. The movements are most marked after meals, but sometimes occur when the stomach is empty and may persist through the night. Little or no pain is present but the patient complains of uncomfortable sensations referred to the stomach. Gastric hyperperistalsis is the result of an increased irritability of the sensory or motor nerves of the organ due to a reflex resulting from gastric hyperæsthesia or to irritation from excessive acidity, fermentation or distention; it may occur with pyloric stenosis.

Symptoms. These are loss of appetite, eructations, nausea and vomiting. In severe instances the patient may lose flesh and strength and the continuous discomfort brings on a neurotic condition. The contractions may be felt by the examiner's hand and at times when very active, may be seen as well. At times the small intestine may take part in the excessive peristalsis and cause the regurgitation into the stomach and even the vomiting of intestinal contents.

Treatment. The drug treatment is identical with that of pyloric spasm and the patient should be advised to lead a regular and quiet life, avoiding mental and physical exertion. Intra-gastric galvanism and hydrotherapeutic procedures are useful adjuvants. Only easily digestible foods should be allowed in order to avoid all irritation of the stomach and possibility of distention by means of fermentation products. A rest cure with rectal alimentation continued for a fortnight may bring about good results in severe instances.

MERYCISM.

Synonym. Rumination.

Definition. This is a condition in which the patient voluntarily or involuntarily causes his food to return to the mouth where it undergoes further mastication and is swallowed again or expectorated.

It occurs in individuals of neurotic habit as a rule, and in marked instances the food is regurgitated after every meal, the patient often asserting that the act causes pleasant sensations. The condition of the gastric secretions is not uniform but a subacidity seems to exist in most patients.

Treatment. This consists in the correction of secretory disorders by the use of hydrochloric acid or alkalies as the case may be. The patient's nervous and general condition should receive attention and he should be enjoined to masticate slowly and thoroughly. He should be encouraged to resist the impulse to raise his food and to combat the habit with the utmost strength of his will. Bits of cracked ice taken after meals are said to be useful and intra-gastric electricity may be employed. The administration of ten grains (0.65) of quinine sulphate after each meal may break the habit by rendering the food unpleasantly bitter.

The diet of these patients should consist chiefly of easily-digested fluids and semi-solids.

NERVOUS ERUCTATION.

Synonyms. Aerophagia.

Definition. This symptom is often seen in hysterical and neurasthenic patients. The gas raised is usually tasteless and consists chiefly of swallowed air, and various gastric symptoms may or not be co-existent. The belching frequently occurs in paroxysms but at times is almost continuous.

Treatment. This consists in teaching the patient to guard against swallowing air. This is a habit which a little thought and attention on his part can stop; keeping the mouth continuously open for a half hour or so at a time may be tried for air cannot be swallowed when the mouth is open. The neurasthenic or hysterical condition should receive general treatment to

which massage and hydrotherapeutic measures are useful adjuncts. The bromides, arsenic and belladonna may be employed, and the following pill may be found effectual: \mathcal{R} extracti physostigmatis, gr. $\frac{1}{8}$ (0.006); extracti belladonnæ, gr. $\frac{1}{2}$ (0.012); strychninæ sulphatis, gr. $\frac{1}{8}$ (0.0015). *Signa*; one pill three times a day. Hysterical patients may be cured of this habit by administering fifteen minim (1.0) capsules of ether every half hour until the symptom disappears. The explosion of the capsule in the stomach after a few minutes seems to have a peculiar moral effect.

Purinæmic conditions may result in neurasthenia, and when such are accompanied by nervous eructation the treatment is plainly that of the causative factor.

CYCLIC VOMITING.

Definition. Cyclic, paroxysmal, periodic or recurrent vomiting is a condition seen in adults, but more usually in children and characterized by the sudden appearance of violent and persistent emesis which may persist long after the stomach has been entirely emptied.

Symptoms. The attacks usually appear when the child is about two years old and recur with a lessening degree of frequency as puberty approaches when they cease. The intervals vary in different patients, being from a few weeks to a few months, and at times the vomiting is so severe and continuous as to bring about a condition of collapse which has been known to result fatally. The attacks are not usually preceded by nausea nor is there an effort attached to the act. The cause of this condition is not definitely known but it is probable that it is a disorder of metabolism. Both acetone and diacetic acid have been found in the urine preceding or during the attack.

Treatment. This at times will be found to have little effect, but the administration of large doses of sodium bicarbonate—one hundred to one hundred and twenty-five grains (6.50 to 8.30) per day—is the most approved means and may succeed in aborting or cutting short the paroxysm. It has been suggested that fats—except fresh butter—are not well borne by patients subject to this manifestation and that too large a carbohydrate content in the diet may produce digestive changes which favor the occurrence of the vomiting. During the attack it is better not to attempt to feed the patient, but if the paroxysm is protracted rectal feeding may be instituted and at all times it is well to administer water by this route to allay the thirst—six to eight ounces (300.0 to 500.0) four or five times a day being a sufficient quantity. When the attack has ceased the first foods allowed may be broths, small amounts of cold milk and lime water, equal parts, and barley water. Attention should be given to the patient's general hygiene during the intervals of the paroxysms.

C. SENSORY NEUROSES.

GASTRIC HYPERÆSTHESIA.

Definition. This is a sensory disturbance of the stomach in which the ingestion of food results in pain referred to the organ, at times so great as to cause reluctance on the part of the patient to eat. Hysterical individuals may assert that only certain articles of food cause the distress while others may be eaten with impunity. This neurosis often occurs in anæmic and chlorotic conditions, after period of over-eating or indulgence in indigestible foods and as a result of sexual or alcoholic excesses.

Another cause is hyperacidity and the condition may also exist in organic nervous diseases such as tabes dorsalis.

Symptoms. These are distress after eating and nausea, often followed by vomiting. When the stomach is empty they are absent. Often medicines can be taken without difficulty when the smallest amount of food, no matter what its character may be, will cause distress. Often pulsation of the aorta is complained of and constipation is usually present. Diffuse tenderness over the region of the stomach is frequently observed and other nervous manifestations, such as headache and various neuralgias, are common. Examination of the stomach contents reveals nothing characteristic.

Treatment. Attention should be given to the constitutional condition, if this is the causative factor, and a rest cure is frequently effectual. The pain itself may be controlled by hot applications and the use of an intra-gastric spray of cocaine and menthol, care being taken to control the amount of the former drug. Intra-gastric galvanism is appropriate, and, when the intra-gastric electrode cannot be used, external galvanism with the electrodes applied to the abdomen may be employed. Silver nitrate one-fourth of a grain (0.015) in two drachms (8.0) of peppermint water taken in water a half hour before each meal has been suggested, and the bromides and codeine may produce good results.

The diet should at first be of milk taken a small quantity at a time. Later, as the condition becomes ameliorated, eggs and semi-solids may be allowed, and finally a return to solid food may be permitted. Later massage, hydrotherapeutic measures, moderate exercise, and a change of climate are to be recommended.

Alcohol, tobacco and the abuse of tea and coffee should be forbidden.

GASTRALGIA.

Synonyms. Gastrodynia; Gastric Neuralgia.

Definition. This is an affection characterized by severe paroxysmal pain referred to the stomach. The pain may be localized in the epigastrium

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or may radiate to any part of the abdomen or to the back. It occurs in motor and secretory neuroses, and in various other gastric lesions such as ulcer and cancer, in certain nervous diseases, such as tabes dorsalis, during infectious diseases, especially malaria, in nervous and hysterical conditions, and as a reflex pain the result of diseases of the genito-urinary organs, particularly in women.

Gastralgokenosis. This term has been coined by Boas to represent painful gastric emptiness, a painful sensation when the stomach is empty and which is relieved at once by taking food.

Idiopathic gastralgia occurs in chlorotic and anæmic states, in convalescent conditions, nephritis and various toxæmias, and especially in incipient pulmonary tuberculosis. The fact that it often manifests itself with hyperchlorhydria in early phthisis is responsible for mistaken diagnosis and treatment, many of these patients putting themselves in the hands of the gastrol-ogist who is apt to mistake the real causative factor of the condition.

Symptoms. The attacks of pain usually begin suddenly and are at times so severe as to be almost unendurable, perspiration appears upon the forehead, the pulse is weak and may be faster or slower than normal. There may be suppression of urine; the bowels are usually constipated. The patient is much prostrated. As the severity of the paroxysm wanes the patient begins to yawn, belches gas, and may vomit.

Treatment. This consists in the proper management of the underlying cause when this can be ascertained. If no cause can be found symptomatic treatment must be instituted. Various analgesic drugs such as codeine sulphate, one-half grain (0.03) every three or four hours, chloroform water, two drachms (8.0), hydrated chloral, ten grains (0.65), hyoscyamus, belladonna, etc., may be employed. To patients with cardiac depression, compound spirit of ether may be given and stimulation by means of aromatic spirit of ammonia or alcohol may be necessary. Acetanilide, methyl acetanilide (exalgine), pyramidon (a derivative of antipyrine) and other anti-neuralgics are recommended. In instances characterized by very severe pain opium may be employed but only with the greatest caution lest the habit become formed. It is best given in the form of opium and belladonna suppositories or hypodermatically as morphine sulphate in connection with atropine. These drugs are useful in lessening the patient's pain but have no curative effect; the routine employment of electricity is an excellent method of treatment. The faradic current may be employed but the galvanic is likely to accomplish better results, a current of twenty-five milliamperes at least being necessary. Large flat electrodes are used; they are moistened in water as hot as can be borne and applied, the anode to the epigastrium and the cathode to the inter-scapular region. Gastric lavage with a mixture of a pint (500.0) of camphor water, and a drachm (4.0) bismuth subgallate with two drachms (8.0) bismuth subnitrate is said to be

efficacious. The camphor water should be measured as it returns and not more than an ounce (30.0) allowed to remain in the stomach.

The diet should consist of easily digestible foods. Spices, condiments, alcohol, and excessive amounts of tea and coffee are to be avoided.

BULIMIA.

Synonym. Hyperorexia.

Definition. Bulimia is a condition characterized by an excessively large appetite. It occurs chiefly in persons affected with functional or organic nervous disease such as hysteria, epilepsy, brain tumors, with intestinal parasites, diabetes, Graves' disease, uterine diseases, and various gastric conditions.

Symptoms. The hunger comes on suddenly, at times even directly after a full meal. The symptom is almost irresistible and if it is not appeased palpitation of the heart, paleness, faintness, noises in the ears and gastric pain ensue. In some patients even small amounts of food suffice to cause a disappearance of the symptoms. Commonly, although not always, associated with this condition is an absence of a sense of satiety—comfortable fulness—known as *akoria*.

Treatment. This must be instituted with a view to improvement in the cause of the neurosis. The nervous system, the genito-urinary system, the stomach, or whatever may be at fault, must receive appropriate treatment. The bromides are useful, Fowler's solution in doses increased to the limit of tolerance is recommended, and the administration three times a day of one drachm (4.0) of camphorated tincture of opium or of two drops (0.12) of the tincture of belladonna in two drachms (8.0) of simple elixir may prove effectual. Gastric atony, if present, may be treated by massage and strychnine, and intra-gastric faradism should achieve good results. Lavage with warm and cold water alternately may be employed.

ANOREXIA NERVOSA.

Definition. Nervous anorexia is a state in which the appetite is wholly lost and the sense of hunger unknown. This definition does not include the symptomatic inappetence of various acute and chronic diseases. This manifestation may last for months, even while the digestive apparatus is perfectly normal in condition. The neurosis is more commonly seen in female subjects and is predisposed to by, and almost always associated with, hysteric and neurasthenic conditions. It also occurs in chlorosis and in individuals addicted to the abuse of drugs, especially alcohol, tobacco and opium. The degree of the distaste for food determines the prognosis of the affection. Those subject to this manifestation become progressively anæmic

and lose flesh and strength, the pulse is weak, the extremities are cold. Insomnia is common. The diagnosis of the affection is simple but that of its cause is more difficult.

Treatment. This consists in combating the anæmia and the nervous condition by appropriate medication and in properly managing any co-existent organic disease. The rest cure—removing the patient from outside influences and placing him in the hands of a trained attendant, and over-feeding him—is an excellent method; in this connection electrical and balneo-therapeutic measures and massage are to be employed, as well as any means in the line of suggestion that the physician may be able to use. If the refusal to eat is carried to extremes there should be no hesitancy in employing forced feeding by gavage. If the repugnance to taking food is due to discomfort attendant upon this act the administration of sodium bromide—ten to fifteen grains (0.65 to 1.0)—before meals may overcome this disinclination. Orexin—five to ten grains (0.30 to 0.65)—before such meals in a little warm bouillon may cause a distinct increase in appetite and the following formulas may be found useful: \mathcal{R} tincturæ cinchonæ, \mathfrak{J} ss (2.0); acidi sulphurici diluti, \mathfrak{m} vii (0.5); syrupi zingiberis, \mathfrak{J} iiiss (14.0). Misce et signa, take before meals through a tube in a claret glass of water. \mathcal{R} fluidextracti condurango, \mathfrak{m} xlv (3.0); strychninæ sulphatis, gr. $\frac{1}{40}$ (0.0015); acidi hydrochlorici diluti, \mathfrak{m} x (0.65); elixiris gentianæ, q.s. ad \mathfrak{J} ss (15.00). Misce et signa, take in wine-glass of water before each meal through a tube. Chewing of calamus will often produce good effects.

During the past few years there has been a disposition on the part of some surgeons to regard a gastro-enterostomy as a panacea for all neuroses of the stomach whether secretory, motor, or sensory. But when one realizes that the gastric symptoms are in the larger number of cases merely expressions of some disturbance, it may be, in a distant organ, the conviction should prevail that generally the only reason for such an operation is the ease with which it can be done. Observations of a considerable number of patients who have undergone this operation make it clear that while temporary benefit may be noted the final result is a worse condition than the one for which the operation was performed. In some instances it has been necessary to restore the parts to their former anatomical relations so far as was possible. This operation should not be allowed except on the advice of an experienced physician.

DISEASES OF THE INTESTINES.

ACUTE CATARRHAL ENTERITIS.

Synonyms. Acute Diarrhœa; Acute Intestinal Catarrh; Acute Ileo-colitis.

Definition. An acute inflammation involving the small intestine and at times the upper portion of the colon.

Ætiology. This disease is more common during the hot months and especially in children. The heat is not so much a direct cause as it is a predisposing one, since it diminishes the bodily resistance and increases the susceptibility of the intestinal tract to the influences of over-eating or improper food. Acute intestinal catarrh often follows excessive indulgence in food or drink, particularly if the substances taken are improper, such as unripe or decayed fruit, decomposed food, contaminated drinking water or the like. The ingestion of irritant drugs such as mercury bichloride or arsenic may cause intestinal inflammations and the condition is also predisposed to by any sudden chilling of the body. Excessive or diminished secretion of bile may be mentioned as causes, the former if it be irritant and the latter since it may favor fermentation by depriving the intestine of the supposed antiseptic effect of this fluid.

Enteritis often accompanies certain of the infectious diseases and is predisposed to by conditions of congestion of the intestine such as occur in cardiac and hepatic lesions and by inflammations of adjoining structures such as the peritonæum. Chronic wasting diseases, tuberculosis, cancerous states, anæmia, etc., may be complicated by acute diarrhœa.

Pathology. The mucous membrane lining the intestine is first congested, red and swollen; the secretion is at first diminished but later there is an excessive production of mucus with exfoliation of the epithelial cells; the solitary follicles are hyperæmic and swollen and may become filled with pus; such tiny abscesses may rupture, leaving ulcerating surfaces. In severe forms of the inflammation the agminated follicles also may be involved in like manner. Chronic inflammation may result in rare instances.

Symptoms. Diarrhœa is the most characteristic of these. The evacuations at first consist of ordinary fæcal matter, but as they continue they contain bile, mucus, and finally become watery. In severe instances blood may be present. They vary in number from five or six to fifteen or twenty per day, and may be accompanied by colicky pain and tenesmus. They are likely to be foul at first and accompanied by gas, later they may lose their odor. Loss of appetite is the rule, and nausea and vomiting may be present. A rise of temperature of two or three degrees F. may accompany the diarrhœa, and thirst and diminished urine are noted as a result of the loss of water through the intestinal tract.

Physical examination reveals little more than moderate diffuse abdominal tenderness, meteorism and gurgling in the intestine.

Diagnosis. When the inflammation is localized various symptoms may call attention to probable involvement of particular portions of the intestinal tract. If the skin, conjunctivæ and urine are colored with bile pigment it is probable that the inflammation particularly affects the duodenum. If the jejunum and ileum are involved to the exclusion of the large intestine diarrhœa is absent, but the pain, distention and other symptoms are present; often

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small masses of mucus are found in intimate admixture with the contents of the large bowel (Nothnagel's sign); the diagnosis of inflammations affecting this portion of the alimentary tract alone is difficult and of little practical value. When the morbid condition involves both the small and large intestines tenesmus is likely to be marked and much mucus is present and may be observed distinct and separate from the fæces which may contain bits of undigested food (lienteric diarrhœa). The diagnosis of acute intestinal catarrh should present no great difficulties; it may be differentiated from enteric fever by its short duration, lack of characteristic temperature curve, absence of exanthem and of a positive Widal reaction.

Prognosis. The condition is not a serious one, recovery under proper treatment taking place within a few days.

Treatment. In mild instances the patient need not be confined to his bed but should refrain from exertion of any sort. Certain patients need no treatment further than a restricted diet, for as soon as the intestine has by its own action rid itself of the cause of the inflammation, spontaneous recovery takes place. In most instances, however, it is better to aid nature by administering a laxative which shall hasten the passage of the offending substance. The laxatives most often used are calomel and castor oil. The former is best given in doses of one-fourth to one-half of a grain (0.015 to 0.03) every half hour until six doses are taken; it exercises, in addition to its purgative action, an antiseptic effect upon the intestine from a partial conversion into corrosive sublimate, while castor oil, which should be given in single dose of two to four drachms (8.0 to 16.0), has the advantage of a slightly constipating after-effect. The emptying of the bowel may be facilitated, especially in children, by irrigation of this viscus with warm normal saline solution by means of a rectal tube or soft rubber catheter inserted six inches (15 ctm.) into the bowel, and a fountain syringe elevated from one to two feet (30 to 60 ctm.).

When intestinal astringents or antiseptics are necessary on account of the prolongation of the diarrhœa, any of the salts of bismuth may be given, the subsalicylate—ten to twenty grains (0.65 to 1.30) every four hours—being especially effectual. Bismuth naphtholate (orphenol) five to fifteen grains (0.30 to 1.0), resorcinol—two to eight grains (0.12 to 0.5)—or phenyl salicylate (salol), two to five grains (0.12 to 0.30)—may also be employed. If the diarrhœa still persists, opium in sufficient doses of the tincture or of Dover's powder, as suppositories or in the form of an opium and starch enema—one or two teaspoonfuls (4.0 to 8.0) of starch, one to two grains (0.065 to 0.130) of powdered opium, and eight ounces (240.0) of warm water, should be given.

For the constipation resulting from the use of opium, laxatives need not be given since the bowels will, as a rule, move normally after a few days. The hypodermatic administration of morphine may be necessary in severe in-

stances when frequent vomiting and purging preclude the exhibition of opium by mouth or rectum.

The abdominal pain may be controlled by hot or cold compresses.

Diet. During the first day or two of the attack as little food as possible should be allowed and that preferably in the form of milk. As the condition becomes ameliorated other non-irritating foods such as bouillon, soft-boiled eggs, milk toast, etc., may be eaten, to be followed as the diarrhoea ceases, by sweetbreads, calf's brain, scraped beef, meat jellies, the white meat of chicken and mashed potatoes. Green vegetables, fruit and all irritating and indigestible articles of diet should be omitted from the diet for some time.

CHRONIC CATARRHAL ENTERITIS.

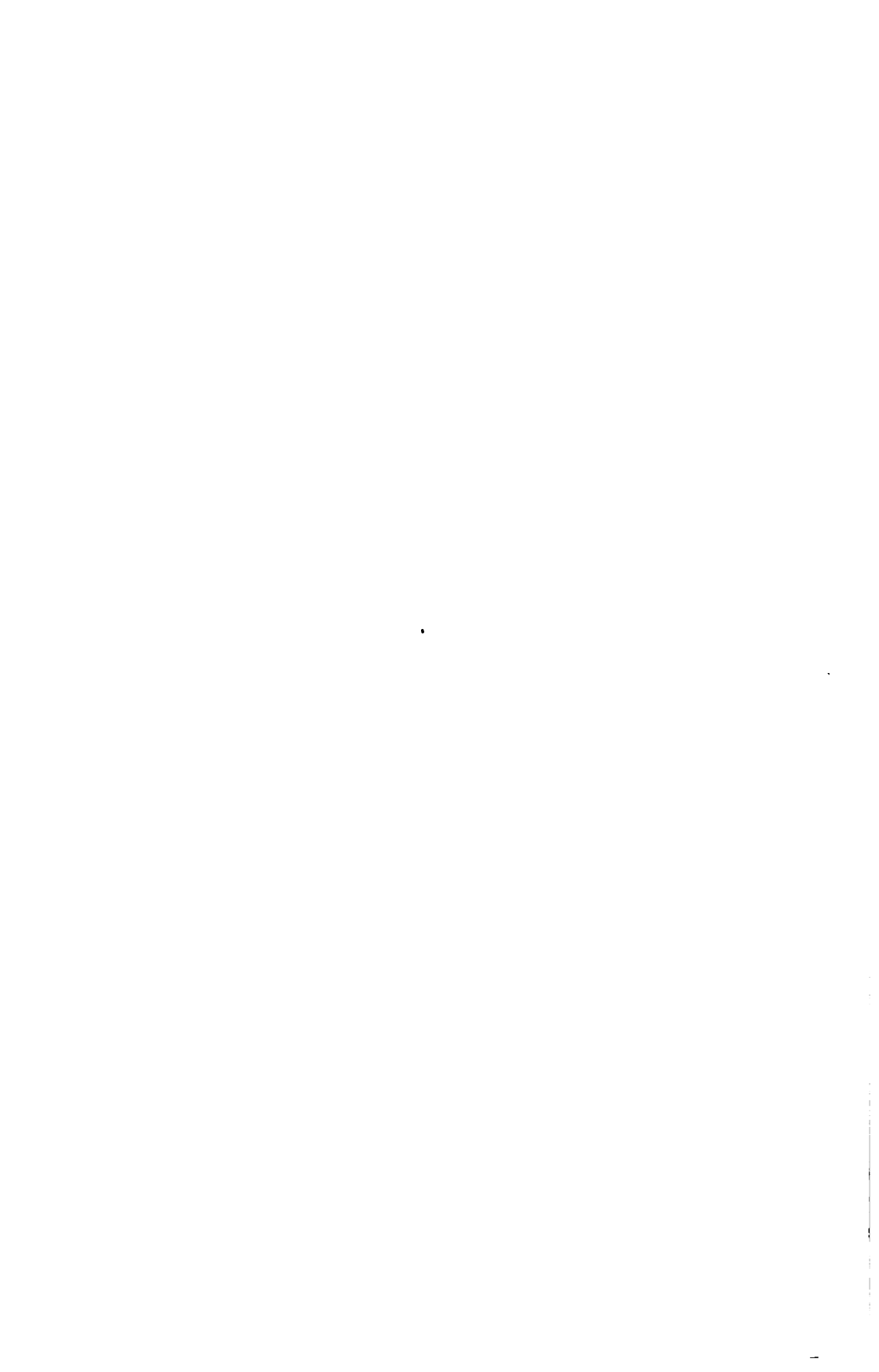
Synonyms. Chronic Diarrhoea; Mucous Colitis; Chronic Entero-colitis; Ulcerative Colitis.

Definition. A chronic catarrhal inflammation of the small and large intestine, characterized by the excessive production of mucus, and, at times, the development of ulcers.

Ætiology. This disease may follow attacks of acute entero-colitis or of dysentery. The affection may occur primarily, and it is predisposed to by cardiac lesions, hepatic cirrhosis, or any other condition attended by chronic hyperæmia of the digestive tract, by conditions of feeble nutrition, purinæmic states, and chronic wasting diseases such as anæmia, nephritis or phthisis. It may follow the infectious diseases, notably malaria and cholera.

Pathology. At first the pathological state is that of acute catarrhal enteritis; these lesions become permanent and in marked instances ulceration of the lymph follicles takes place with consequent hæmorrhage, and, when the ulcers heal, cicatricial contractions which may result in stenosis. Pigmented spots in the diseased mucous membrane are sometimes observed and the destruction of the intestinal glands by the inflammation may result in atrophy of the mucous membrane and, at times, of the muscular and peritonæal coats of the bowel. The remnant of the mucous membrane is often slate-colored. In the small intestine pigment may be deposited in the ends of the villi and in circles about or in the centers of the solitary follicles, producing the shaven-beard appearance.

Symptoms. While diarrhoea is the rule in acute entero-colitis, in the chronic form of this inflammation this is not the case. The bowels may be constipated, there may be diarrhoea or there may be an alternation of these conditions. A fairly constant symptom is the presence of mucus in the movements from the bowels. This mucus is variable in quantity, from a small amount mixed with the fæcal matter to large masses discharged in the form of casts of the intestine. If ulceration exists there may be blood in the stools.



The type of the disease characterized by the passage of casts of the bowel is seen usually in neurotic women. This variety is known as mucous colitis, the exacerbations of which are likely to be brought on by mental emotion of various kinds. Rarely an epileptiform convulsion may be an antecedent symptom. Constipation is usually present and at intervals stools of the type described above are passed, accompanied by tenesmus and abdominal pain and tenderness.

Subjective symptoms may be wholly absent in chronic entero-colitis, the appetite and gastric digestion are often good but there are at times abdominal discomfort and flatulence.

Physical examination may reveal nothing characteristic, although sometimes tympanites may be detected. When the intestinal contents are fluid palpation may elicit gurgling and in the type of the disease of which constipation is a feature the hard faecal masses may be made out.

The course of the disease is often long drawn out and the patient may be apparently well save for his intestinal symptoms. Other patients become gradually emaciated and may die from exhaustion rather than from the disease itself.

Prognosis. As regards life this is good but recovery, especially in instances of long standing, is distinctly difficult to secure.

Treatment. This is unsatisfactory, consequently many drugs have been recommended as useful. Of these silver nitrate may be mentioned first. Its dosage is one-fourth grain (0.015) three times a day, or it may be given in one to one thousand aqueous solution in doses of two to three drachms (8.0 to 12.0) three times a day. Other metallic astringents such as copper sulphate, one-fourth of a grain (0.015), lead acetate, two grains (0.13), or zinc sulphate, two to four grains (0.13 to 0.25), may be employed. Other drugs, given with the idea of lessening the diarrhoea by means of inhibiting the fermentive and putrefactive processes going on in the intestine may be mentioned, almost without number. The best of these are the bismuth salts, especially bismuth naphtholate (orphenol), five to fifteen grains (0.30 to 1.0), bismuth tribromophenolate, eight grains (0.5) and bismuth tetraiodophenolphthaleinate, five to eight grains (0.30 to 0.50). The subsalicylate, the subgallate and the subnitrate may also be employed in doses of ten grains (0.65) or more, frequently repeated.

The vegetable astringents are less effective than the bismuth salts but in view of their former popularity may be mentioned. What action they exert, for they may not act as astringents when introduced into the alimentary tract, is due to their tannic acid content, which doubtless has some inhibitory effect on bacterial activity and may neutralize its products. Of these calumba, catechu, rhatany, and tannic acid may be mentioned. Tannalbin tannicol and tannigen in doses of eight to fifteen grains (0.5 to 1.0), as well as the calcium salts—the phosphate, carbonate and salicylate—given in solution

in carbonated water, may be employed. Coto—the powder in dose of ten grains (0.65), or as cotoin, one grain (0.065)—is used empirically.

Neurotic diarrhœas due to hysteria, the symptom complex of neurasthenia, migraine, and the climateric require not only careful management based on the underlying cause but call for a further word of comment. The best results are obtained from the persistent use of the bromides, preferably strontium bromide (free from the barium salts), sixty to ninety grains (4.0 to 6.0) daily. After three days this may be diminished in quantity and the solution of potassium arsenite commenced, three drops (0.2) thrice daily and increased by one drop (0.065) per day until slight untoward symptoms supervene.

Nephritic or uræmic diarrhœa should be recognized as a salutary effort of the organism to rid itself of the poisons whose effects we characterize as “uræmia.” The proper method of dealing with this condition is the administration of a high intestinal irrigation of normal sodium chloride solution, in quantity a gallon (4 litres) of a temperature of 112° F. to 116° F. (44.5° to 46.5° C.) through a rectal tube, inserted at least twelve inches, the reservoir being elevated about three feet. If the chronic nephritis is predominatingly parenchymatous, the sodium chloride should be replaced by sodium bicarbonate. Intestinal irrigation will free the bowel from irritating contents, will enable the kidneys to functionate normally and will stimulate the heart.

Purinæmic diarrhœas are best combated by sixty grains (4.0) daily of saligenin tannate, regulation of the diet and inhibition of intestinal fermentation by intestinal antiseptics until the proteid metabolism is re-established upon a satisfactory basis.

Malarial diarrhœa is best treated by arsenic, methylthionine hydrochloride (methylene blue) or a combination of extract of ergot, two grains (0.13), berberine sulphate one grain (0.065) with piperine one-half of a grain (0.03) four times daily.

In patients who have survived the acute onset of cholera, a diarrhœa frequently persists. This is best treated by bismuth tribromophenolate, ninety to one hundred and twenty grains (6.0 to 8.0) daily. In addition ~~died~~ suprarenal extract, three grains (0.20) three times a day, will assist in restoring the vascular tone.

If bile pigment is present in the stools the disturbance is presumably high in the intestine and a combination of salicylic acid, six grains (0.40), with the same amount of acid sodium oleate, with four grains (0.25) of phenolphthalein and one-half grain (0.03) of menthol, given once daily for several days, will disinfect the bile and remove this cause of intestinal indigestion.

The constipation occurring in chronic entero-colitis must never be allowed to persist and should be combated by mild rather than drastic measures. Enemata of warm water, castor oil, calomel or laxative waters such as Hunyadi, Apenta, etc., are the best means of controlling this symp-

Denticulatus

tom. Fæcal impactions are best relieved by softening them by quart (litre) injections of warm olive oil, the patient being in the knee-chest position, or drachm (4.0) doses of arsenic-free sodium phosphate twice daily by mouth; one-fiftieth of a grain (0.0012) of physostigmine salicylate twice each day will enable the intestinal muscularis to recover its tone.

Opium is admissible in the treatment of chronic diarrhœa only, when the alimentary canal has been thoroughly emptied, to check excessive peristalsis. It should be given hypodermatically, as morphine, in substantial doses, and not repeated. A prescription for opium, or any of its preparations or alkaloids, should never be entrusted to patients of the nervous type because there is too great danger of habit formation.

The extract of denarcotized opium and extract of belladonna have been recommended as useful in the relief of the abdominal pain from which some patients suffer, but both these drugs should be employed with utmost caution, the former on account of the danger of causing the habit, the latter lest toxic symptoms be induced.

Treatment by means of colonic irrigation is effectual when the chief seat of the inflammation is the large intestine. A soft rubber rectal tube passed high into the bowel and attached to a fountain syringe or a large funnel should be used. Various solutions have been employed in this connection, those preferable being silver nitrate one or two to one thousand, boric acid one to one hundred, salicylic acid two to one hundred, tannic acid two to four to one thousand, zinc sulphate three to one thousand, and mercury bichloride one to fifteen thousand. The last is irritating and if absorbed is likely to produce mercurial intoxication, consequently it should be administered with great caution.

Diet. By far the best diet for chronic entero-colitis is milk, but it cannot be continued indefinitely. The author reserves its use for between meals and at bed time. The first choice is a properly peptonized milk, not taken too cold. For the meals clear meat soups, gruels, eggs, poached on toast, soft-boiled or raw, fresh butter, sweetbreads, calf's brain, rare, grilled or broiled steak or lamb chops, fresh chopped beef, with one-half drachm (2.0) of dilute hydrochloric acid to each two ounces (60.0), oysters and fish, toast, hard rolls, mashed potatoes and macaroni, will carry the patient well toward the time when a regular mixed diet may be resumed. To be avoided are fruits, raw or sour, cooked or sweetened, succulent vegetables, fat meats, all highly seasoned and indigestible foods, foods leaving much residue, and sugar. All dishes should be properly cooked and prepared as simply as possible in every way.

Mineral waters seem to have a certain influence upon chronic intestinal catarrhs. The waters of Carlsbad and Vichy have a considerable vogue among European clinicians and the waters of Saratoga and of the Virginia hot springs of our own country may prove quite as beneficial. Water cures

at home are seldom as beneficial as when taken at the springs for the mode of life, regular diet and exercise at these resorts has an additional favorable action upon the lesion. Aside from sojourns at spas, other changes of climate and scene may benefit the patient.

Hydrotherapeutic procedures have a place in the management of chronic diarrhœas, and a course of cold water treatment at an institution frequently acts favorably. Diarrhœas from cold almost invariably may be relieved by the daily use of a morning cold bath. The bath should commence with a temperature of 88° F. (31.1° C.), and be taken cooler by a degree or so each morning until 68° F. (20° C.) or even 58° F. (14.5° C.) is reached. A five minute bath followed by a brisk rubbing with a rough towel results in a vigorous reaction, and the morning bath not only soon becomes a therapeutic necessity, but a luxury as well. In addition an abdominal bandage of flannel should be constantly worn. Wet abdominal binders and hot or cold compresses are often useful adjuncts to treatment, used and omitted alternately, week by week.

CHOLERA MORBUS.

Synonyms. Cholera Nostras; Sporadic Cholera.

Definition. An acute inflammation of the stomach and intestines characterized by profuse emesis, diarrhœa, and severe abdominal cramps.

Ætiology. No micro-organism has yet been proven to be the specific cause of this disease although it is possible that it may be of bacterial origin. Until its specific cause is isolated we must consider it to be the result of the ingestion of impure, decomposing or indigestible articles of food, such as decayed or unripe fruit, fish, salads, etc. Attacks of cholera morbus are most frequent during the hot months and seem to be predisposed to by exposure to draughts while the body is over-heated.

Pathology. The morbid conditions found in fatal instances of cholera morbus resemble too closely those of acute enteritis to need separate description. Sometimes no lesions are found.

Symptoms. The onset of cholera morbus frequently takes place in the night. The patient is seized, without warning, with nausea, followed by vomiting, profuse diarrhœa, and severe abdominal cramps. The vomitus consists at first of the stomach contents followed by bile and later by watery fluids. The stools are often so frequent as to be almost without interval, at first they are of the fæcal matter contained in the bowel but soon become very loose and watery. A rise of temperature is infrequent. Thirst due to the rapid loss of water is marked. The pain is abdominal, paroxysmal, and colicky; the muscles of the limbs later become painful; in severe instances the patient may fall into a state of collapse, with marked bodily weakness, cold, clammy skin and weak and rapid heart action.

Diagnosis. Acute ptomaine poisoning and toxic doses of arsenic must be excluded. From Asiatic cholera this disease will be differentiated by the character of the stools, bacteriological examination of the dejecta, and history of exposure.

Prognosis. Death may supervene in rare instances but recovery from the acuity of the attack within half a day is the rule. The depression, weakness, and irritability of the digestive tract may last for a few days longer.

Treatment. Since the train of symptoms known as cholera morbus is the result of some irritating substance in the gastro-intestinal tract the first indication in treatment is to get rid of the cause of the offense. This may be done by administering calomel in doses of one-fourth grain (0.016) every half hour until six doses have been taken, or castor oil one-half ounce (15.0). In patients with marked and frequent vomiting it may be impossible for medication given by the mouth to be retained; here the most approved method of cleansing the intestine is by high rectal irrigations of warm water.

The severe pain may be controlled by the application of counter-irritation by means of the mustard or flax-seed poultice or a capsicum plaster to the abdomen. These should be carefully watched lest they cause blisters. When relief is not brought about by these means the hypodermatic injection of morphine may become necessary, but this remedy should be used with the greatest caution.

In the later stages of an attack the use of a prescription such as the following may be indicated: *R* acidi sulphurici aromatici, mvi (0.4); extracti hæmatoxylon, mvi (0.4); spiritus chloroformi mxxii (0.8); fluid-extracti ipecacuanhæ, miii (0.2); syrupi zingiberis, q. s. ad ʒi (4.0). *Misce et signa*, one dose every two hours.

The marked thirst must be relieved by supplying water to the tissues either by high rectal enemata of normal saline or by hypodermatoclysis of the same solution. The latter process consists in allowing a pint (500.) or more of saline to run into the tissues through a needle attached to an irrigation apparatus and plunged into the thigh or buttock, the skin of which has been previously sterilized and, if advisable, anæsthetized by means of an ethyl chloride or ether spray. This quantity of the solution will be quickly absorbed and the procedure may be repeated if necessary.

For the vomiting the patient should be given cracked ice to hold in the mouth, sips of iced champagne or carbonated waters. The tendency to collapse necessitates the exhibition of hypodermatic stimulation, strychnine, camphor or ether, etc., the application of heat to the extremities or wrapping the body in a hot sheet.

Diet. During the acuity of the attack and for a day or more after, the less eaten the better. As the vomiting ceases the patient may begin to take small quantities of milk and lime water or milk mixed with a carbonated mineral

water and, as progress toward recovery is made, soups, toast, soft boiled eggs, etc., may be allowed, to be gradually followed by a return to ordinary diet.

HILL DIARRHŒA.

Definition. An acute diarrhoeal disease characterized by whitish, frothy stools occurring in the morning and a tendency to abdominal tympanites.

Ætiology. This disease is seen in the mountainous regions of British India in persons who are accustomed to residence in the tropics but have gone from lowland to highland districts.

Marked humidity, the disease being contemporaneous with the rainy season, and a high altitude seem to be the chief predisposing factors in its occurrence. Its specific cause has not been determined.

Pathology. The pathogenesis of this disease is probably based upon a transient disorder or cessation of the hepatic and pancreatic functions which may be the result of the effort of an impaired digestion to accomodate itself to unusual meteorologic conditions. By certain observers it is considered to be induced by the effect of the unusual cold and dampness of the early morning of tropical mountainous climates upon the atonic colon which is likely to be met in those who have lived in hot countries for considerable periods of time.

Symptoms. The disease is evidenced by disordered digestive function and the appearance of a morning diarrhœa. The stools increase progressively in number until there are eight or ten daily, the first appearing about daybreak, the last about noon or shortly before this time. The dejections are colorless, of large size, pasty or frothy, and of sickenish odor. Pain is not marked though there may be slight discomfort referred to the region of the colon. Abdominal cramps and tenesmus are conspicuously absent. Abdominal distention is a prominent symptom and there is manifest digestive disturbance characterized particularly by discomfort after meals. This disease is analogous to sprue but differs from the latter in its tendency to recover after a few weeks. Certain instances may progress and terminate in true psilosis, while others persist until the patient returns to a lower altitude.

Treatment. This consists in combating the tendency to digestive disorder by means of an exclusive diet of milk, the use of warm clothing, rest, and by keeping the patient in bed until the noon hour. Chologogues, especially calomel in small doses, are indicated, or small doses of corrosive sublimate may be substituted for it. The administration of pilocarpine hydrochloride, one-eighth to one-third of a grain (0.008 to 0.02), is suggested with a view to increasing the pancreatic secretion.



Artificial digestive ferments particularly pepsin and pancreatin may prove useful. Patients whose disease is uncontrollable by ordinary means must be sent to low-lying districts.

DIARRHŒA OF CHILDREN.

Acute Gastro-enteritis.

Synonyms. Summer Diarrhœa; Gastro-intestinal Catarrh.

Definition. An acute catarrhal inflammation of the gastro-intestinal tract characterized by vomiting, diarrhœa and a febrile movement.

Ætiology. The specific cause of this disease is probably bacterial. Various micro-organisms have been considered to have a part in the production of this condition, namely the colon bacillus, the streptococcus, the staphylococcus, the bacillus pyocyaneus, the bacillus proteus and Shiga's bacillus. The disease is predisposed to by teething, hot weather, unhygienic surroundings and poor bodily condition. The exciting cause seems usually to be improper feeding, either in quantity or quality. Not only bottle-fed babies are subject to the infection but those fed on mother's milk are often attacked, since improper diet, mental excitement, etc., are capable of materially changing the mother's lacteal secretion and thus causing the digestive disturbance.

Pathology. The gross appearance, except for the presence of excessive mucus, is little changed. The mucous lining of the gastro-intestinal tract may either be pale or hyperæmic and the solitary and agminated follicles of the small intestine may be swollen. Patches of congestion may be observed in the large intestine. The intestinal walls are not thickened.

Symptoms. The disease occurs in two chief types, the mild and the severe. In the former the onset is gradual with symptoms of indigestion, little or no rise of temperature, restlessness and fretfulness; the stools become more frequent, are diarrhœal in character, greenish, yellowish or brownish in color, of bad odor and contain undigested food; later mucus appears.

In the second type the onset may be gradual, with symptoms of digestive disturbance, or sudden, with a rapid rise of temperature—102° to 105° F. (38.9° to 40.5° C.)—hot dry skin, restlessness, and vomiting. There may be convulsions or stupor. The thirst is often extreme. The vomitus consists first of undigested food, and if emesis continues after the stomach has become empty, mucus or bile may be vomited. In certain patients the vomiting may be wholly absent. The diarrhœa may not appear for a number of hours after the onset of the attack. The stools are at first fæcal and are accompanied by colicky pains and gas; later they become thin, watery and foul; in color they are grayish, greenish or brownish. They contain mucus after a few days and may be as many as fifteen or twenty during the twenty-four hours. The child rapidly becomes weak and emaciated; the disease

may prove rapidly fatal or the symptoms may abate and the condition become subacute. Relapses are not rare and an entero-colitis may ensue.

Treatment. Prophylaxis, in view of the probable infectious character of the disease, consists in careful attention to the surroundings and hygiene of infants, especially during the summer, the immediate washing or disinfection of all soiled napkins, and, above all, proper feeding, the use of boiled water for drinking purposes and the boiling of bottles and nipples—in the case of artificially fed infants—previous to their use on every occasion. Breast feeding should be encouraged and mothers advised against weaning during the summer.

The treatment of the attack proper consists in measures calculated to relieve the digestive tract of its irritating and toxic contents. If the vomiting is persistent the stomach should be washed by means of a soft rubber catheter of appropriate size attached to a rubber tube of larger calibre and a funnel. The lavage should be continued until the water returns clear and it is wise to leave a little water in the stomach. If the vomitus has been very acid a little sodium bicarbonate may be added to the water left behind. In children who struggle against the stomach tube full draughts of boiled water may be substituted.

The small intestine should be relieved of its contents by cathartics. When vomiting is not a feature, castor oil, two drachms (8.0), may be given to a child of one year while older children may take up to one-half an ounce (15.0). The stomach should remain empty for two hours then the castor oil can be given ice-cold and nothing taken by the mouth for another two hours. Nothing but sterile water is to be given by the mouth. After waiting from twenty-four to seventy-two hours until all diarrhoea and vomiting has ceased then give one-fourth of a grain (0.015) of powdered rhubarb with ten grains (0.65) of sodium bicarbonate in a teaspoonful (4.0) of sterile water every two hours. Calomel in divided doses of one-fourth to one-half a grain (0.016 to 0.030) should be given every half hour up to six doses. The tablets may be dissolved in a teaspoonful of boiled water and thus are willingly taken.

The colon should be irrigated with warm normal saline solution. Two quarts (litres) should be used and given through a soft catheter passed high into the bowel. This procedure should be carried out twice or thrice during the first day of the attack and once a day thereafter. Drugs are often unnecessary but should they be indicated bismuth subgallate in doses of three or four grains (0.2 or 0.25) may be given to a year old child every three hours or phenyl salicylate (salol) in doses of one to two grains (0.065 to 0.13) may be administered. Antacids, such as lime water, milk of magnesia or chalk mixture, are often useful when hyperacidity of the stomach with fermentation is present.

For patients with marked prostration stimulation is necessary in the form of whiskey or brandy given frequently in small amounts fully diluted. A

half ounce (15.0) in divided doses during the twenty-four hours is not too much for a child of one year. Hot mustard baths and applications of heat are useful and if the diarrhoea has been profuse enough to deprive the system of a large amount of water, this should be supplied by rectal irrigations or by hypodermatoclysis of warm normal saline solution.

Diet. Too great emphasis cannot be laid on the statement that no food should be given for at least twenty-four hours, or for even longer periods, should the vomiting continue; cold water should be supplied, however, and thin barley water or albumin water (the white of one egg in eight ounces (250.0) of boiled water) to which a little brandy has been added, are allowable. If these are refused the stomach should be allowed to rest.

Usually after twenty-four hours the child may be nursed, but for not longer than two to three minutes, at intervals of at least four hours. In the intervals barley or albumin water may be given. Gradually the intervals between breast feeding may be lessened and the length of the nursing prolonged so that in four or five days the child is fed as usual.

Bottle-fed infants should be deprived of all milk until the vomiting and diarrhoea have ceased and the intestinal irrigation returns clear. Then the feeding should begin as follows: A milk from as reliable a source as possible should be obtained. The bottles should stand upright in a refrigerator for six hours. The top ounce (30.0) of two quart (litre) bottles should be taken, this should be diluted to the strength proper for the age of the child with cold, unboiled filtered water, to which one-fourth as much lime water and six drachms (24.0) of milk sugar have been added, and the child fed the proper amount at the correct intervals. When the usual feeding is resumed the milk should be boiled, the quantity should be small and the dilution very weak, and the proper strength and quantity gradually reached.

During convalescence the child should be carefully watched and if possible a change of climate is advantageous. The climate does not seem to matter particularly, so long as excessively hot neighborhoods are avoided; babies taken from the city to the country and *vice versa* do well. All errors in diet should be studiously guarded against.

Cholera Infantum.

Definition. An acute catarrhal inflammation of the intestinal tract, of very severe type, characterized by high temperature, profuse diarrhoea and great prostration.

Ætiology. No specific cause for this disease has been isolated but it seems to be closely associated with the decomposition of the intestinal contents, especially if this is due to impure milk. The predisposing causes are poor general condition, unhealthy surroundings, etc.; they are similar to those of acute gastro-enteritis.

Pathology. *Post mortem* examination generally reveals no marked abnormality in the affected intestine.

Symptoms. Cholera infantum usually occurs in children in whom there has been previous intestinal disturbance. Prostration and fever are often present before the appearance of the vomiting and diarrhoea. The former may appear first or both it, and the purging, may occur simultaneously. The emesis is frequent, the vomitus at first consisting of the contents of the stomach, then of mucus, serous fluid and later bile. It is brought on by the ingestion of any food or drink. The patient is very thirsty and eagerly drinks water only to vomit it almost immediately. The movements from the bowels are copious, greenish, yellowish or brownish and may be as many as twenty or thirty in twenty-four hours. Their odor is, as a rule, not foul but at times is offensive, and as the disease progresses they become serous.

Nervous symptoms are frequent; at first they are those of excitation of the nervous system, later they may merge into convulsions, stupor or coma. The prostration is marked and emaciation is rapid. The temperature varies with the severity of the attack from 102° to 105° F. (38.9° to 40.5° C.), the pulse and respiration are rapid and weak and at times irregular. In the fatal instances the skin is cold and clammy and the facies typical, the eyes being sunken, the skin pale and the expression anxious to a marked degree. The cerebral symptoms may lead to a mistaken diagnosis of brain lesion, but they are probably the result of the action upon the nervous system of toxins absorbed from the intestine. In patients in whom recovery takes place the emesis and purging become less frequent, the constitutional symptoms become ameliorated, the temperature falls and the nervous symptoms subside. Convalescence is slow and relapses are very likely to occur.

Prognosis. This is serious, the outcome in many instances being fatal.

Treatment. This can hardly be considered satisfactory. The first indication is to relieve the digestive tract of its toxic contents. This is to be done by means of gastric lavage and colonic irrigation as described in the section on acute catarrhal enteritis (*see* p. 419); the action of purgatives is too delayed. Drugs by mouth are vomited, consequently hypodermatic medication must be undertaken. For the nervous manifestations morphine sulphate, one-fiftieth to one one-hundredth of a grain (0.0012 to 0.0006) with atropine sulphate, one five-hundredth of a grain (0.00013) may be given to a child of one year of age and may be repeated in an hour if improvement is not noted. For the pyrexia baths are indicated. They should be begun at 80° F. (26.1° C.) and reduced to 70° F. (21.1° C.), may last from ten to twenty minutes and may, if necessary, be repeated every hour or two. When baths, for any reason, are impossible, wrapping the patient in a wet sheet, or cold water injections may be substituted, and as an adjunct to the hydrotherapeutic measures, ice compresses or an ice cap should be applied to the head.

To supply the fluid lost by emesis and diarrhœa hypodermatoclysis, given as described under the treatment of cholera morbus (*see* p. 425), is indicated. Eight ounces (250.0) or more of normal saline should be administered in this manner every twelve hours.

There should be no attempt to give food or medication, except stimulants, by the mouth. The patient may suck bits of ice and stimulation by means of brandy or iced champagne—small amounts frequently repeated—may be administered by this route. If these are not retained hypodermatic stimulation—brandy or whiskey, camphor, ether, etc.—is indicated.

The feeding and convalescence of patients suffering from cholera infantum are to be managed according to the principles laid down under the treatment of acute gastro-enteritis (*see* p. 429).

Much can be done with regard to the prophylaxis of this disease by means of attention to the suggestions to be found on page 428.

Acute Entero-colitis.

Synonyms. Acute Ileo-colitis; Follicular Enteritis; Dysentery.

Definition. An acute inflammation of the mucous membranes of the ileum and colon chiefly involving the lymph follicles of these structures.

Ætiology. This disease is most frequently seen during the summer. The predisposing causes are the same as those of acute gastro-enteritis. The children affected are usually under two years, although the condition may occur up to the fifth year. Recent research seems to have established a definite connection between Shiga's bacillus and this affection, this organism being demonstrable in the stools, and characteristic agglutinative blood reactions being obtainable in a large majority of patients.

Pathology. The colon is the chief seat of the lesions and when the ileum is involved these extend to a distance of but two or three feet above the ileo-cæcal valve. The mucous membrane is congested and swollen and the solitary and agminated follicles are enlarged. The follicles of the large intestine may go on to ulceration but the agminated follicles of the ileum rarely are subject to this process. The ulcers may penetrate to the muscularis, the wall of the intestine may become infiltrated with white cells and its thickness may be increased to two or three times the normal. There may be small hæmorrhagic spots and the formation of a false membrane may occur. The mesenteric lymph nodes are frequently enlarged.

Symptoms. Ileo-colitis may have its origin in an attack of cholera infantum or acute gastro-enteritis or it may occur as a primary infection. At the onset the symptoms often resemble those of acute indigestion, viz., vomiting, abdominal pain and distention, a rise in temperature and diarrhœa; the stools at first are loose and yellowish or greenish, later they contain mucus and blood, are very frequent and may be accompanied by pain. The mucus may be

clear or mixed with fæcal matter. After a week or thereabouts the symptoms may disappear and the patient slowly recover, or they may become more severe, with persistent fever, frequent stools of mucus and blood, pain and tenesmus, loss of appetite and increasing prostration and loss of weight. Nervous symptoms, dry, brown and ulcerated tongue and diminished urine, at times containing albumin and casts, are features of the severe infections.

Prognosis. Such patients may go on in this manner for four or five weeks and die, or convalescence, which is always very slow and likely to be interrupted by relapses, may become established. Few of these patients recover completely, their powers of resistance being so deteriorated that they are subject to any intercurrent disease and they, as a rule, finally succumb.

Treatment. Prophylaxis consists in early and careful treatment of all intestinal disorders and the employment of the measures suggested under acute gastro-enteritis (*see* p. 428).

The treatment of the attack consists in emptying the gastro-intestinal tract by means of systematic gastric and colonic lavage and the exhibition of cathartics as laid down on page 428; the pain and restlessness should be controlled by paregoric or the deodorized tincture of opium. Local treatment of the diseased areas in the intestine by means of intestinal irrigations of normal saline solution is important. A quart or two (1000.0 or 2000.0) of the solution at a temperature of about 102° F. (38.9° C.) being allowed to flow into the bowel and out again through a soft catheter passed as high as possible two or three times a day. If there is much blood in the stools small injections of hot water—108° to 112° F. (42.3° to 44.4° C.)—or of ice water are useful and injections of astringents—a drachm (4.0) of tannic acid to the pint (500.0) of warm water—may be employed. If the injections cause the child to struggle they must be omitted. In such instances, and in others which do not respond to the injections, bismuth subnitrate in considerable doses—twenty grains (1.30) or more every three or four hours to a child of one year—or castor oil in emulsion—ten minims (0.65)—at the same intervals may be administered.

In the later stages good results may attend the use of gelatin which may be employed as follows: two and one-half drachms (10.0) of a ten percent. aqueous sterilized solution should be warmed and added to the child's bottle. This dosage should be given three times on the first day of its employment—the amount of gelatin taken by the child being forty-five grains (3.0) per day—and increased fifteen grains (1.0) daily. It is said that this treatment quickly lessens the number of the stools, supposedly by mechanical action.

Attempts at serum treatment have been made but decision as to the benefit to be derived must be reserved at present. It may be that an earlier application of this method in a larger percentage of cases would yield better

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results for it was only when given near the onset of the disease that any improvement was noticeable.

Stimulation is usually necessary. Well diluted brandy is to be preferred with iced champagne as a second choice; of either half a drachm (2.0), or more if necessary, may be given a child of one year every two or three hours. In instances of profound shock atropine sulphate hypodermatically, beginning in doses of one five-hundredth of a grain (0.00013), pushed to the limit and followed by brucine has been recommended.

It must be remembered that too much medication is usually much worse than too little, in fact, when the acute symptoms have disappeared and the temperature is but little above normal and the movements are less than six a day, patients frequently do better when all drugs are stopped—save stimulants—and the bowel is irrigated only every second or third day. For such patients a change of air will often effect wonders.

The diet during the acuity of the attack is identical with that described for instances of acute gastro-enteritis. After the acute stage is over, great difficulties are often experienced and the most judicious feeding is necessary. Each patient must be studied by himself and no fixed rules can be laid down. To infants the top-milk plan (*see* p. 429) must be applied, and foods which may be given are peptonized skim milk, broths, beef peptonoids, barley or rice water and the various artificial malted foods. Feeding by gavage may be necessary in instances of disinclination to eat. Food should not be given oftener than every two or three hours, but drinking water may be allowed in the intervals.

For older children during convalescence, scraped beef, kumyss, gruels, and soft boiled eggs are allowable. The greatest attention should be given the diet for a long period after an attack since the slightest indiscretion may result in a recurrence of the disease.

Hygienic treatment should be carried out as described under the treatment of acute gastro-enteritis (*see* p. 428).

DIARRHŒA CHYLOSA.

Synonyms. White Diarrhœa; Coeliac Disease.

Definition. An intestinal catarrh characterized by profuse discharges of a gruel-like color and consistence.

Ætiology. The disease occurs in children under five years, resembles in some particulars the Hill diarrhœa (*see* p. 426) of adults. Tuberculosis in apparently not a causative factor. Intestinal ulceration has sometimes been observed.

Symptoms. After an indefinite illness of several or many days stools resembling gruel become frequent. These may not be, but generally are, frothy but are large and usually of vile odor. There is moderate, doughy distention of the abdomen. Emaciation takes place rapidly.

Prognosis. This disease advances slowly and is likely to prove fatal.

Treatment. This should consist in thorough intestinal lavage and later high normal saline irrigations or tannic acid, one drachm (4.0) to the pint (500.) of warm water, may be substituted.

PSEUDO-MEMBRANOUS ENTERO-COLITIS.

Synonyms. Croupous Entero-colitis; Diptheritic Entero-colitis.

Definition. An acute inflammation of the lining of the intestine accompanied by the formation of a false membrane.

Ætiology. This disease is probably the result of the irritant action of chemical substances resulting from intestinal fermentation or of infection by bacteria. The former factor may act in poisoning by mineral substances, such as arsenic, mercury or lead. The condition may also be secondary to various of the infectious diseases such as pyæmia, scarlatina, smallpox, etc.

Whether here the intestinal lesion arises directly from infection by the specific organism causing the disease or not is uncertain. Diptheritic enteritis also occurs as a complication in cachectic states, nephritis, hepatic cirrhosis, etc.

Pathology. Usually only the large intestine is affected but in the instances due to mineral poisons the small intestine may also be involved. Early in the disease the lesions are usually those of simple intestinal catarrh, but more infrequently the membrane is present from the inception of the inflammation. The membrane varies in size and thickness and is grayish white in color. Ulceration may be present with necrosis and perforation or increase in thickness of the intestinal wall.

Symptoms. These are not characteristic and in mild instances they may be unnoticed. Severe instances resemble dysentery (*see* p. 75) the stools are frequent, thin and accompanied by tenesmus; they may contain blood, pus and bits of the membrane. The course of the disease is greatly influenced by its causation, but it is usually slow.

Prognosis. The outlook is not good, death occurring from exhaustion, peritonitis or hæmorrhage. Patients who recover are often left with permanent stenoses due to the contraction of the intestinal cicatrices.

Treatment. This consists in the proper management of the co-existent and causative affection and in the relief of the symptoms as they arise. For details the reader is referred to the sections on the treatment of intestinal ulceration and colitis.

PHLEGMONOUS ENTERITIS.

This is a rare affection. It is probably of infectious origin and consists in an infiltration by pus of the intestinal wall. It may follow other intestinal inflammations such as ulceration and has occurred in strangulated hernia

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and intussusception. Little is definitely known about the disease and diagnosis *ante mortem* is considered impossible.

HÆMORRHAGIC INFARCT OF THE BOWEL.

Definition. An extravasation of blood into the intestinal wall resulting from thrombosis or embolism of one of the mesenteric arteries or one of their branches.

Ætiology. The causes of intestinal embolism are identical with those of embolism of any other part, namely valvular heart disease, aneurysm, etc.

Pathology. The walls of the jejunum and ileum are congested and swollen and a clot obstructing either the superior or inferior (usually the former) mesenteric artery or one of their branches is demonstrable. Congestion and infiltration may also be observed in the mesentery.

Symptoms. Of these the most important is hæmorrhage from the bowel. The onset of the affection is usually marked by sudden nausea followed by vomiting, colicky pain and abdominal distention. The bowels are loose and the movements may contain blood from the beginning or not until later. Instances in which the symptoms closely resemble those of obstruction are more rare.

Prognosis. This is bad although recovery is possible through the establishment of a collateral circulation. If embolism or thrombosis of the mesenteric arteries is pronounced, the course of the disease is rapid and, with few exceptions, terminates fatally.

Treatment. This is unsatisfactory it being limited to the relief of the symptoms and the diminution of the excessive blood pressure in the portal circulation by means of cardiac stimulation and venesection.

Surgical interference—resection followed by enterostomy—has been successful in a few instances.

ULCERATION OF THE BOWEL.

Ulcer of the Duodenum.

Ætiology. Duodenal ulcer probably occurs more often than is generally supposed and is produced by the same causes as those which result in gastric ulcer, with which it may be associated. Its chief ætiological factors are traumatism resulting from foreign bodies, excessive gastric acidity, local infection, embolism or thrombosis in the duodenal wall, with consequent tissue necrosis, and severe skin affections such as burns, erysipelas, etc. Ulcer of the duodenum, however, is much less frequent than gastric ulcer.

Pathology. The morbid anatomy is similar to that of gastric ulcer (*see p. 380*) in every way both in gross appearance and under the microscope.

The lesion may be single or multiple and is usually in the first portion of the duodenum. Perforation takes place more frequently than in gastric ulcer, and general or localized peritonitis often walled off by adhesions results. When the adhesions involve the neighboring organs perforation into these may occur.

Symptoms. These are so little characteristic as to render diagnosis very difficult and often when they are sufficiently marked to raise suspicion they are so analogous to those of ulcer of the stomach that differentiation from the latter lesion may be well-nigh out of the question. The most important symptoms are pain and hæmorrhage. The former, however, may be absent or so insignificant as to attract little notice from the patient; it is usually less severe than that of gastric ulcer and is likely to appear at a longer interval, two to four hours, after eating, though this latter statement is doubted by some authorities. Hæmorrhage is not rare, and varies from a quantity so slight as to be hardly noticed to a considerable amount which is either vomited, leaves the body through the intestine or is carried off by both these routes. The vomited blood is similar to that of gastric ulcer, while that passed in the stools is black and tarry.

Jaundice may occur, but is so infrequent as to cause doubt on the part of some observers as to whether it is a part of the clinical picture or merely a coincidence.

Vomiting is not a common symptom; it may appear as a result of co-existent gastric inflammation or be due to duodenal obstruction resulting from the cicatricial contraction of an old ulcer. The vomitus and the stomach contents in duodenal ulcer are not typical in any way.

The appetite is often excellent; the bowels are usually constipated but may be entirely normal in their action.

Perforation induces the usual symptoms of intestinal rupture, either those of general or localized peritonitis.

Differential Diagnosis. The following statements may aid in distinguishing duodenal from gastric ulcer: The former occurs chiefly in males, between the ages of twenty and forty. The hæmorrhage is likely to be intestinal, generally not preceded by hæmatemesis. The blood is not likely to be large in amount and may be bright in color but is sometimes dark. The pain is in the umbilical region and often is relieved by food ingested and the paroxysms of pain and vomiting have no relation to it. The dorsal area of pain is absent. Excepting when the pain is relieved by food it is not modified by regulation of the diet. The hæmorrhage suggests hæmorrhoids, dysentery, tuberculosis and cancer as well as the hæmorrhagic diathesis, all of which must be excluded by the history, symptoms, signs and finally by the preponderance of evidence.

Prognosis. This is not good as regards recovery. In non-perforative instances the symptoms may continue for years despite treatment and in

perforative instances, without adhesions to wall off the general abdominal cavity, death is certain, unless immediate operation is undertaken.

Treatment. This is practically that of gastric ulcer (*see* p. 382) as regards both medical and surgical measures.

Primary Tuberculous Ulceration of the Intestine.

This is a rare condition and one seldom seen in the absence of tuberculous lesions in other parts of the body; still it may occur under these circumstances. The condition is seen, as a rule, in children. The ulcers are situated in the small intestine and the rectum, seldom in the colon. They begin in the agminated follicles as tubercles which undergo caseation and finally ulcer formation. The ulcers are irregularly oval, their longer diameter is parallel to the transverse axis of the intestine, their edges are undermined and there is thickening of the peritonæal coat. Unless in the rectum, where they may be seen by means of the proctoscope, their existence cannot be certainly diagnosed *intra vitam*. Rarely they may be found in the appendix vermiformis.

Symptoms. Those which lead one to suspect the existence of such lesions are diarrhœal discharges with pus and with or without blood, loss of flesh and strength, hectic temperature, abdominal tenderness, and enlarged peritonæal glands.

The fæcal discharges should be examined for the tubercle bacillus, which if found, when it is certain that it has not been swallowed, establishes the diagnosis. Inability to demonstrate the bacillus is not proof that the lesion is not tuberculous.

Perforation of a tuberculous ulcer rarely takes place; when, however, this event happens general or localized peritonitis with its attendant symptoms results. Healed ulcers cicatrize and may, by their contraction, cause stenosis.

Prognosis. This condition may persist for many years without complications or resulting in death.

Treatment. This consists in the employment of the means calculated to relieve the diarrhœa, the pain (*see* p. 386) and the hæmorrhage (*see* p. 394). Local treatment of the ulcers is possible when they exist in the rectum, and the lower colon; here irrigations, after the bowel has been cleansed by an enema of warm water, with solutions of copper or zinc sulphate (three to one thousand), silver nitrate (two to one thousand), silver vitellin (five per cent.), tannic (four to one thousand), or boric acid (two to one hundred) are useful. Ulcers which can be reached by means of the speculum and applicator should be touched with a silver nitrate pencil or with strong solutions of the same salt.

Internally the bismuth salts may be given as suggested under the treatment of chronic catarrhal enteritis (*see* p. 421).

The administration of a combination of sulphur sublimatum, twenty grains (1.30) and pulvis ipecacuanhæ et opii, five grains (0.30) every four hours has been recommended in tuberculous intestinal ulceration in adults.

The diet should be carefully regulated, consist entirely of non-irritating foods and should contain as much nourishment as possible. For more specific directions for the feeding of these patients the reader is referred to the section on the diet of chronic catarrhal enteritis (*see p. 423*).

Embolic Ulcer of the Intestine.

This affection is uncommon and, like other forms of intestinal ulceration, very difficult of diagnosis. The ulcers occur in valvular endocarditis, arteriosclerosis, multiple neuritis, pyæmic conditions, and any other state in which lodgment of an embolus in an artery of the intestine is possible. Following the lodgment of the embolus necrosis of tissue and ulceration take place.

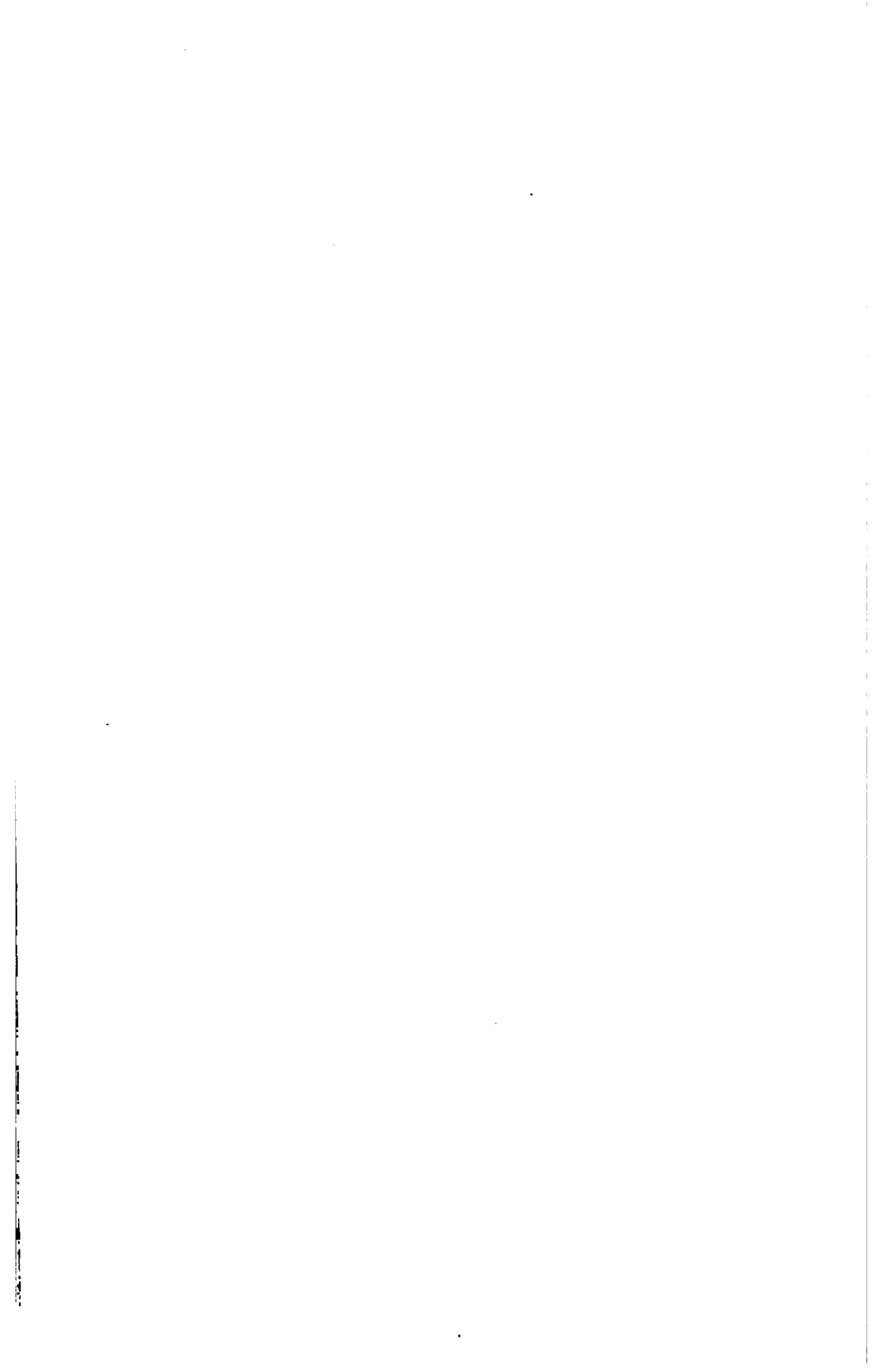
Syphilitic Ulcer of the Intestine.

This is a rare condition especially in the small intestine; syphilitic ulcers of the rectum are more frequently seen and are usually situated within a short distance of the anus. They are shallow, of smooth base, and may occur as primary, secondary, or tertiary lesions; in the last case they result from the breaking down of gummata. In healing they tend to produce strictures, though certain recent observers incline to the belief that this latter is a very rare occurrence.

Treatment. This consists in the administration of mercury and the iodides as described under the section devoted to luetic disease (*see p. 158*), and when the lesions are in proper situation, local applications such as those suggested in the treatment of tuberculous ulceration may be employed.

Stercoral Ulcer of the Intestine.

This is the result of the retention of hard fæcal masses in which, occasionally, lime salts are deposited (enteroliths), and are situated in the colon. The symptoms are those of chronic constipation with or without diarrhœa. In the interval of the latter there appear bearing-down pains and cramps and often expulsion of blood, mucus, and sometimes pus. The mass may be palpable toward the location of which pain on pressure is valuable. The result of treatment is excellent. This consists of saline evacuants and two hours later a quart (1000) of warmed olive oil introduced through a rectal tube at least six inches (15 ctm.) into the bowel and allowed to remain three hours. Then simple enemata are repeatedly introduced until the bowel is thoroughly evacuated. The diet should be meagre for several days.



APPENDICITIS.

Definition. An acute or subacute catarrhal or suppurative inflammation affecting the appendix vermiformis, usually involving the surrounding tissues (typhlitis and peri-typhlitis) and frequently going on to gangrene or perforation of the organ with consequent abscess formation.

Ætiology. While it is probable that this affection occurred as frequently before 1886, the date of the classical paper of Fitz, as it has done since that time, the importance of the disease was not generally recognized previous to that year.

Appendicitis is a disease of young adult life occurring most frequently between the ages of fifteen and thirty years; it is rare in children and after the age of fifty, the atrophic form excepted. Males are more often affected than females, perhaps because they are more prone to muscular exertion or more probably because in the weaker sex the organ receives an additional blood supply from a branch of the right ovarian artery.

The anatomical formation of the appendix greatly favors its liability to inflammation. As it is a blind sac narrower at its orifice than elsewhere, any inflammation of its cavity increases the narrowness of the outlet, thus preventing free drainage and exit of the offending cause of the process and favoring its further development. The shortness of its mesentery is another anatomical factor in the liability of the appendix to infection. This shortness of mesentery is likely to cause a torsion of the organ, which may shut off its blood supply and interfere with its nutrition, since the artery supplying the part is carried in the meso-appendix. Long appendices are particularly subject to torsion because of their proneness to adhere to other tissues.

The presence of foreign bodies—the traditional grape seed, etc.—is much less a factor in the causation of appendicitis than the laity are accustomed to suppose. It is true that foreign substances, especially faecal concretions, are not infrequently found in diseased appendices, but these must be considered as predisposing causes only. Various intestinal parasites have also been found in the situation.

Errors in diet, exposure to cold, excessive muscular exertion and traumatism are also factors in the production of this inflammation.

The exciting cause of appendicitis is a bacterial infection. Of the micro-organisms to be considered in this connection the most important and the one most frequently responsible is the *bacillus coli communis*. This bacterium is a normal inhabitant of the intestinal tract and as such is harmless—even may be beneficial—but, confined in an appendix, in some manner it becomes malignant. Not only is this bacillus capable of exciting appendiceal inflammation but other micro-organisms, such as the streptococcus and staphylococcus pyogenes, the pneumococcus, the bacilli of influenza and enteric

fever, the bacillus proteus and the infective cause of acute rheumatism, having found ingress to the appendix, are potent in this regard.

Pathology. For purposes of ease in description appendicitis may be separated from a pathological standpoint into four types. (a) Catarrhal. (b) Ulcerative. (c) Gangrenous. (d) Obliterative.

In the *catarrhal* type the mucous lining of the organ is congested and swollen, there is excessive production of mucus, with which are mixed leucocytes and desquamated epithelial cells, which distends the cavity of the appendix and the free exit of which is prevented by the swelling of the normally narrow opening of the organ, and also by fibrous tissue binding the swollen lymphoid structures. Such an inflammation predisposes to other like attacks and also lessens the resistance of the appendiceal tissues so that they become susceptible to infection by pathogenic micro-organisms.

In the *ulcerative* type of the affection the mucosa and submucosa are destroyed to varying degrees. The presence of foreign bodies or fæcal concretions is especially likely to produce lesions of this form, it is also seen as a result of the catarrhal and obliterative types, and it may occur in enteric fever and tuberculosis. The ulceration may result in perforation and general or localized peritonæal inflammation.

In the *gangrenous* type rapid sloughing takes place of either the entire organ or portions of its wall; in either case the condition is a very grave one on account of its liability to occur with little or no warning and even without history of previous attacks of the milder forms of appendiceal inflammation. The process may result in general peritonitis of the severest type or the resisting power of the patient may be such as to permit of the walling off of the sloughing part and the limitation by adhesions of the process to a localized abscess cavity.

Obliterative appendicitis is really but a later stage of the catarrhal type, especially of its severer forms, where the submucosa, as well as the mucosa, is involved. Here there is thickening of the wall of the organ by means of cell infiltration, and a consequent decrease in and at times an obliteration of the lumen of the tube. Ulcers also may occur which by contraction or by adherence of their surfaces further tend to contract the calibre of the organ. Of this form of the inflammation three courses may be described: First, the organ may be entirely obliterated and converted into fibrous tissue, therewith precluding all possibility of further attacks of appendicitis; secondly, when mucus or purulent fluid is retained in the cavity of the organ behind a stenosis the patient is subject to appendiceal crises; and thirdly, when the inflammation has been marked enough in character to involve the peritoneal coat, adhesions to other structures, with consequent inflammation of the same by extension of the infection, may be formed. Although this classification depicts the various forms of the disease as the clinician sees them, a better one from the standpoint of prognosis and treatment is that proposed by Morris.

This is: (a) Protective Appendicitis. An irritative lesion, occurring in the course of normal involution of the appendix, and dependent upon irritation of nerve filaments which persist in the contracting hyperplastic connective tissue which has replaced other normal structures of the appendix. (b) Appendicitis with Intrinsic Infection. An infective lesion which seems to be dependent upon any cause leading to rapid swelling of the inner coats of the appendix within the close outer sheath, with consequent compression anæmia, and bacterial attacks upon the tissues rendered temporarily vulnerable by such compression anæmia. (c) Syncongestive Appendicitis. An irritative lesion, due to the presence of serous infiltrates in the tissues of the appendix, and occurring synchronously with similar congestion of neighboring tissues. Such congestion is found with so-called lithæmic swelling of lymphoid structures of the bowel; with obstruction of the lymph and blood circulation through certain diseases of vital organs, and with loose right kidney, which is said to cause obstruction by pressure upon the superior mesenteric vein. (d) Appendicitis with Extrinsic Infection. An infective lesion, due to bacterial approach from other structures lying outside of the appendix, and progressing slowly enough to allow the appendix tissues to develop a good degree of leukocyte protection as a rule. This form of appendicitis is found with tuberculosis of the peritonæum or with infections proceeding from the uterine adnexa for instance. What has been called the obliterative and later the fibroid type appears now as the protective form for the reason that the tissues liable to acute infectious processes are removed from the organ and replaced by connective tissue in the course of normal involution, and this process binds in persistent nerve filaments which being irritated calls out a local hyperleukocytosis which protects the organ against bacterial invasion.

The localized peritonæal inflammations occurring with the appendiceal lesions described above vary in degree from a simple peri-appendicular plastic exudate forming adhesions to the adjacent tissues which limit the spread of the infection, to severer forms with a cavity containing purulent exudate and walled off by adhesions from the general peritonæal cavity. Such an abscess cavity usually occupies the right iliac fossa, although it may be found in any part of the abdominal cavity—in the pelvis, the lumbar region, under the liver, etc.—owing to unusual situations of the appendix. These abscesses contain from a few drachms to a pint (500) or more of thick or thin, odorless or foul pus. The suppurative process may break through its adhesions and discharge into the peritonæal cavity, resulting in general peritonæal infection, or into the intestine, the bladder or vagina. Rupture may also take place outward through the abdominal wall. Metastatic abscesses in the liver may be set up through portal embolism or pylephlebitis.

Symptoms. Mild catarrhal inflammations of the appendix are likely to cause but slight, often hardly noticeable, symptoms; of these pain in the

right iliac fossa and slight tenderness are the only ones worthy of mention; indeed the process may proceed to the ulcerative stage without exciting any apprehension on the part of the patient. When the inflammation has involved the peritonæum locally the symptoms usually become marked. There is pain, at first general, but after a few hours localized over the seat of the lesion in the right iliac fossa, when the appendix is normally situated, but the tendency of this organ to be in anomalous situations may result in localized pain in any part of the abdominal cavity—under the liver, in the left iliac fossa, etc. Change of position increases the pain, as does deep inspiration or coughing.

The tongue is likely to be dry and coated. Vomiting is often present but the vomitus is not characteristic in any way. The bowels are usually constipated, this being due to paralysis of the intestinal musculature. At times this symptom is so marked as to suggest obstruction, and it may be accompanied by fæcal vomiting. More rarely the bowels are loose.

The temperature is usually elevated, 101° – 103° F. (38.5° – 39.4° C.), at first, gradually falling as the process goes on to resolution, or assuming the characteristic irregularity if pus is present, although rarely such instances may occur with pyrexia. The pulse is full and rapid—one hundred to one hundred and twenty. Abdominal distention may be present and is most marked in perforative instances. A leukocytosis of twenty to thirty thousand is not unusual.

Physical Examination. The patient usually lies on his back with the right thigh flexed on the pelvis, this position offering some relief to the pain. Upon palpation a point of more or less localized tenderness will be found. The classical situation for the point of maximum tenderness on pressure is at the middle point of a line drawn from the right anterior superior iliac spine to the umbilicus (McBurney's point), although in anomalously situated appendices it will be found over the site of the inflammation. An important diagnostic sign is rigidity of the abdominal muscles of the right side, these structures going on guard immediately when any attempt at palpation is made.

Another sign of considerable importance is tenderness over the lumbar sympathetic ganglia which are situated about one and one-half inches (4 cm.) to the right and left of the umbilicus close down to the spinal column. Sensitiveness of the right group alone indicates that the appendix is the seat of disturbance, and if the sensitiveness is very marked it is likely to be an appendix, the site of a protective inflammation or degeneration. If both groups are equally sensitive the cause is to be found in the pelvis; if unequally (the right more so than the left), both appendiceal and pelvic disease co-exist (Morris's sign).

After the tissues have been matted together by plastic adhesions or when abscess formation has taken place a tumor of varying size and consistency

may be palpable. Observers with a specialized sense of touch may at times be able to feel the enlarged and inflamed appendix or even, in moderately thin subjects, the normal one.

Over the tumor, when such exists, the percussion note is dull, and in the presence of a considerable quantity of pus may be flat. Excessive distention of the intestine by gas gives a note more tympanitic than normal.

Prognosis. Recovery in attacks of the simple catarrhal type is likely to take place, but recurrences are frequent. In the instances with perforation and abscess formation the outlook is much less favorable, especially where surgical intervention is postponed.

Diagnosis. Typical instances of the disease present no difficulties. Typhlitis may exist, but a very large percentage of these are appendiceal in origin. Cholecystitis, if the gall bladder is distended, offers a tumor, with or without jaundice, at a site much nearer the liver; the difficulty arises only with the appendix in an abnormal position. Renal colic is without fever and has its own distinctive symptoms. Abscess in this region may only be discovered on operation. Various pelvic conditions, extra-uterine pregnancy, and tubal disease, can be excluded without much difficulty. In peritonitis from other causes, pelvic or tuberculous, the previous history and character of the onset are guiding. Acute hæmorrhagic pancreatitis has a diagnostic deep-seated pain. Typhoid fever is excluded by the history and laboratory findings. Pneumonia, the source of many errors, should be excluded by the physical examination of the lungs being negative.

Treatment. Probably there is no point in medicine or surgery upon which authorities are so prone to disagreement as upon the proper management of this disease. The proper method of procedure which is likely to be of the highest interest to the patient is to consult with a competent surgeon and, should a careful weighing of the symptoms point to a probable infection, direct him to operate at once. In this way disaster, in an instance which begins mildly and later has fulminating symptoms, will be avoided. While early surgical intervention in every instance, in this as in other border-line diseases, has its advocates, and these of such character as to demand consideration, it is the part of conservatism, when the physician is absolutely certain that such a course is warranted, to treat an attack of catarrhal appendicitis by medical means and to consider the advisability, after recovery, of the so-called interval operation. Every patient suffering from catarrhal appendicitis should be kept at absolute rest in bed. For the relief of the pain the question of the advisability of the administration of opium is a debatable one. While this drug puts the intestine at rest, thus favoring resolution, as no other drug will, it is insisted by some that its exhibition masks the symptoms indicating the necessity for operative interference. The point against this assertion is that the careful observer will receive sufficient information as to the time for operation from the pulse, temperature, general condition of the patient,

and the state of the appendiceal tumor. Opium itself, given by mouth or in suppositories, is to be preferred to morphine—the latter, however, may be given hypodermatically when the opium itself for any reason cannot be administered by the other channels mentioned. The tincture of opium may be administered in doses of ten or twelve minims (0.65 or 0.8) every hour until two or three doses have been taken, then five minims (0.30) may be given every three hours until the pain is relieved. If the pain recurs another such a course of medication may be instituted. The resulting constipation need cause no alarm but should not be allowed to persist longer than a week.

Local applications to the painful area, of the ice coil, ice bag or ice compress are indicated and will be found to greatly relieve the pain and perhaps retard the progress of the inflammation. Warm compresses may be used after the temperature has fallen to normal and the inflammatory process is quiescent. The use of blisters and leeches is inadvisable since, if operation becomes necessary, the resistance to infection of the skin at their points of application is impaired.

Whether or not to administer laxatives is a debatable question. Active purgatives should never be given. There is no doubt that oftentimes attacks of iliac pain, ~~emesis~~ and constipation with what seems to be a tumor in the appendiceal region quickly recover after a free movement of the bowels, but there is reasonable doubt as to whether such are instances of pure appendicitis; it is more likely that they are instances of fecal impaction. Early in appendicitis the object is to keep the intestine as nearly in a state of complete rest as possible, consequently here, as well as when perforation is imminent or after suppuration has set in, purgation is contra-indicated. Constipation may be allowed to last five or seven days and, when the chances of perforation are past, the bowels may be moved by a carefully given rectal irrigation and should be kept regularly open thereafter.

The elaboration of an antitoxin from the colon bacillus—since this organism is so often concerned in the causation of this disease—has been suggested with the idea in view that patients may be immunized against relapses and against the danger of secondary infection by pus during operation. Thus far no opinion can be properly given.

The diet during the acuity of the attack should be entirely liquid, milk, soups, the artificial infant foods, etc., and in quantity should be small; certain clinicians even advocate feeding *per rectum* in preference to that by mouth. Small amounts of water may be taken. When the acuity of the symptoms has subsided semi-solids may be allowed and later, sweetbreads, scraped beef, cereals, etc., may be added.

The indication for surgical intervention is, in the minds of many competent authorities, the establishment of the diagnosis of the disease, but it is certain that many patients recover under careful medical treatment. Concerning such, the question of an interval operation, with its insignifi-

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cant mortality, is one to be decided among the patient, his physician, and his surgeon. The most conservative clinicians concur that operation is indicated in all instances in which the symptoms do not ameliorate within twenty-four hours, in instances in which an abscess has formed and in early instances of general perforative peritonitis. There are certain moral responsibilities in the presence of acute appendicitis which cannot be set aside. The insidious progress of the gangrenous form of the disease leaves open a large opportunity for error to the disadvantage of the patient. Conference with an intelligent surgeon generally leads to a sound opinion. Advanced instances of diffuse peritonitis which are in a state of practical collapse with rapid and feeble pulse, clammy and cold skin, are hardly fit subjects for operation. Here stimulation, heat to the extremities, high rectal irrigations of normal saline solution and the other means usually employed in such conditions are indicated. Very rarely does recovery take place. In the presence of an atrophic, obliterating, or, better, a protective appendicitis the question of operation is entirely different. The appendix is not a source of danger in most instances, but the local disturbance is merely symptomatic. Probably it is this kind of appendix which has mortified more surgeons than any other. These appendices and similar ones, the usual atrophic appendices beyond the fifth decade of life, all are to let alone, as a general rule.

INTESTINAL OBSTRUCTION.

Definition. A condition in which the normal passage of fæcal matter through the bowel is impeded. This may result from mechanical obstruction or paralysis of the intestinal musculature and may be due to a number of different causes.

Intestinal obstruction occurs in two forms:

(a) *The acute*, which may be caused by congenital anomalies, internal strangulation, volvulus, intussusception, foreign bodies, or abnormal intestinal contents and intestinal paralysis.

(b) *The chronic*, which is the result of narrowing of the calibre of the bowel from new growths within this structure, cicatricial contraction, from the outside pressure of tumors of neighboring organs or structures or of the accumulation of impacted fæces.

1. Congenital Anomalies.

These are the result of insufficient or improper foetal development and may be situated at any part of the digestive tract. The most frequent sites are at the pylorus (*see* p. 395), in the duodenum, in the ileum, and at the anus. Oftentimes there may be stenoses at two or more of these situations.

Symptoms. In instances of imperforate anus there is no passage of meconium and the examining finger will at once perceive the defect. When the obstruction is at other parts of the digestive tract the symptoms usually do not appear until food has been taken. Here the symptoms are vomiting, at times stercoraceous in character, abdominal pain, and ineffectual efforts to pass fæces. At times visible peristaltic action may be detected upon inspection of the abdomen. The prognosis is not good.

Treatment. This is wholly surgical. An imperforate anus may easily be relieved by means of the knife. A stricture at a higher level offers difficulties since the diagnosis of its situation is well-nigh impossible. Death, however, being certain without operation, this latter should be undertaken, and the stenosis being found, either a resection should be done or an artificial anus formed. Either operation is unsatisfactory for death from inanition is practically sure to supervene.

2. External Strangulation.

This is the most frequent variety of intestinal obstruction and is caused by compression of the bowel by inflammatory adhesions or bands, foetal remains, such as the omphalo-mesenteric duct of which Meckel's diverticulum is a remnant, the slipping of a knuckle of the intestine into one of the peritonæal fossæ, through the foramen of Winslow, through the diaphragm, etc. The small intestine is involved in the great majority of instances and the affection is most common in males in early adult life.

Symptoms. Of these the most prominent is sudden, very severe pain which is, as a rule, constant, but may be accentuated at intervals. Persistent vomiting occurs, and after two or three days becomes stercoraceous. The bowels are constipated, but absolute constipation does not come on until the bowel below the obstruction has emptied itself. The intestine above the obstruction is distended with flatus (Wahl's sign) and may be demonstrated upon physical examination. The temperature is at first unaffected, later it may rise to 101°–102° F. (38.5°–38.9° C.); the pulse is rapid and weak. In the various forms of acute obstruction a useful diagnostic symptom is the gradual increase in abdominal girth which is due to the augmenting meteorism. This symptom may be demonstrated by taking measurements at intervals.

Treatment. This consists in operation as soon as the diagnosis is made. In instances in which consent to operate is withheld, means for relieving the patient's symptoms should be instituted as described under the treatment of intestinal obstruction in general (*see* p. 450).

3. Volvulus.

This form of intestinal obstruction is due to a twisting of a loop of the intestine about the mesentery as an axis. It occurs most often in men of



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middle age and is rather infrequent. The small intestine is usually involved, although instances of volvulus of the stomach and of the colon have been recorded. The torsion of the bowel causing interference with its blood supply, peritonitis and at times necrosis with rupture may result. This type of obstruction is not an infrequent sequel of abdominal operations.

Symptoms. The pain of this form of obstruction is less severe than in any other variety. The constipation, however, is absolute and abdominal distention is a marked feature. The vomiting and other symptoms are similar to those of obstruction due to strangulation.

Treatment. Methods other than by operation will be dealt with under the general management of intestinal obstruction (*see* p. 450.).

4. Intussusception.

Intestinal intussusception consists in the telescoping of one section of the bowel into another. The invagination consists of the *intussuscipiens*, the receiving or outer layer, and the *intussusceptum*, comprising the two inner layers of which the middle is the returning and the innermost the entering layer. The condition is named in accordance with the part or parts of the intestine involved, e.g., enteric when the small intestine alone is affected, ileo-cæcal when the ileum and cæcum are invaginated into the colon, etc. Usually the upper part of the bowel makes up the intussusceptum, but in rare instances reverse intussusception occurs, in which case the opposite condition obtains.

Ætiology. Intussusception is seen most frequently in children under a year old, but is not unknown in adult life. As a cause of obstruction it is nearly as common as strangulation. It is predisposed to by diarrhœa and constipation, and while its actual cause is not well understood, it probably results when one portion of the bowel, due to some nervous disturbance, suddenly contracts while a neighboring segment remains relaxed. Intussusception just *ante mortem* frequently takes place and the condition is found on necropsy without having caused symptoms during life.

Pathology. Inflammatory processes arising in the serous surfaces of the bowel brought into contact by the invagination may set up adhesions, also permanent attachment between intussusceptum and intussuscipiens. And the invaginated portion may necrose and, the adhesions being of such character as to prevent exit of the intestinal contents into the abdominal cavity, and being passed, spontaneous recovery may take place. In other instances the adhesions being insufficient the sloughing may result in rupture with general peritonitis.

Symptoms. The first of these are sudden pain and vomiting. The pain is usually paroxysmal and very severe in character; as a rule it is not distinctly localized, although in some patients it may be referred to the umbilical region. It is most severe during the first two or three days of the attack, later it become

less marked. The vomiting is usually persistent and difficult to control, it may be projectile in character but is rarely fæcal in infants, though in older children it may become so. Bloody stools with mucus are a frequent symptom in children, and when the intussusception involves the rectum tenesmus is a common manifestation.

The constitutional symptoms are those of marked prostration, with muscular relaxation, pallor, cold extremities, and subnormal temperature, which late in the disease may rise as high as 104° F. (40° C.).

Examination shows the presence of a "sausage-shaped" abdominal tumor in the majority of instances, and when the lower colon is involved it may be possible to feel the intussusceptum. It resembles the cervix uteri and may even protrude for an inch or two. There may be a depression in the right iliac fossa (Dance's sign). Measuring the circumference of the abdomen from hour to hour is important in the diagnosis of obstruction; if the abdomen gradually becomes larger is strong probability of its existence.

Prognosis. The affection may terminate by spontaneous reduction or by sloughing of the invaginated bowel, rupture of the intestine being guarded against by adhesions. Death from shock may take place—in the more acute instances—from peritonitis, or from exhaustion.

Treatment. This consists in attempts at reduction by means of inflation of the intestine or the injection of fluids. When these measures are ineffectual immediate laparotomy is necessary.

Inflation is practiced by means of a soft rubber catheter to which an ordinary bellows is attached. The air should be forced in very gently and may be prevented from escaping by compressing the nates. The hands should be kept upon the abdomen to determine the degree of tension of the intestine. If reduction follows, rumbling sounds may be detected and the tumor may disappear, but often there is no proof of the success of the treatment; here the air should be permitted to flow out and a thorough manual examination of the abdomen undertaken. Even then the continuance or the remission of the symptoms is the only index of the efficacy of the procedure. Anæsthesia is necessary for the proper carrying out of this mode of treatment unless the abdomen is greatly relaxed.

The injection of fluids is a legitimate method of treatment and is preferred by some to inflation. Either normal saline solution or milk and water at a temperature of from 100° to 105° F. (37.4° to 40.5° C.) may be employed. The injection is given from a fountain syringe placed about five feet, or less if the patient is a child, above the patient and through a soft catheter, the exit of the fluid being prevented by compression of the buttocks. Inversion of the patient, if a child, should be practiced at intervals. The fluid should be allowed to flow for about a quarter of an hour, then it may be permitted to escape. Whether reduction has been accomplished may then be determined as after inflation.

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The after treatment consists in absolute rest in bed and the administration of moderate doses of opium for several days. No laxatives should be administered during this period and the diet should consist entirely of fluids.

Unfortunately a recurrence of the intussusception not infrequently takes place.

5. Obstruction by Foreign Bodies.

The most common cause of this form of obstruction is a biliary calculus; other foreign bodies such as coins, fruit pits, buttons, intestinal parasites, enteroliths, etc., may be mentioned but are much more infrequently causes of intestinal occlusion. This variety of obstruction takes place in most instances in the small intestine, not infrequently at the ileo-cæcal valve.

The symptoms so closely resemble those described under the sections devoted to other types of occlusion as to need no separate discussion.

6. Strictures and New Growths.

Obstructions due to these causes are rare and occur chiefly in adults beyond middle life. They seem to be more common in females than in males and are met usually in the large intestine. Cicatricial strictures follow healed ulcers especially those due to tuberculosis. Syphilitic stricture of the rectum also has been observed. Adhesions and bands, eventually compressing the bowel, are by no means rare after enteric fever.

Annular stricture of the intestine, and particularly of the rectum occurs in intestinal cancer of the colloid type and also in cylindrical-celled epithelioma (*see* intestinal cancer, p. 460). Various benign neoplasms of the bowel may cause occlusion, and tumors external to the intestine and inflammatory processes of the neighboring structures, by pressing upon the bowel, may cause obstruction.

7. Obstruction Due to Fæcal Impaction.

Fæcal obstruction as a result of chronic constipation or paralysis of the intestinal musculature is not infrequent. Its most common site is low in the large intestine and it is seen more often in old persons and in women, rather than in men.

Ætiology. This condition is predisposed to by chronic constipation and by chronic intestinal and peritonæal inflammations. It is particularly frequent in the insane and in hysterical and neurasthenic individuals. Its usual site is the large intestine, particularly the cæcum and sigmoid flexure. The mass of fæces, gradually accumulating in atonic conditions of the intestine, becomes dry and firm and sets up irritation of the intestinal lining. The intestinal musculature above the impaction may undergo hypertrophy

and the internal irritation may spread to the peritonæal coat of the bowel, resulting in a local peritonitis.

Symptoms. Of these the most important is an increasing constipation. The abdomen is distended and tympanitic. The breath is foul, the tongue coated and the patient feels weak and languid. Examination reveals a fæcal tumor situated in the cæcal region or other part of the colon with distention in the cæcum or iliac fossa (Bouveret's sign). The mass is more or less firm but may be indented by pressure. If it is in the sigmoid flexure it may consist of a number of separate masses; in the colon proper it is likely to be sausage-shaped and of varying length. Patients of this type with partial occlusion are subject at any time to complete obstruction with its attendant symptoms.

Treatment of Intestinal Obstruction in General.

The difficulty in the treatment of this condition is to determine when operative interference may be postponed and internal treatment relied upon. In general it may be stated that when there is reason to suspect strangulation, operation should be done at once and that internal measures may be employed only in such patients as give no evidence of abnormal circulatory conditions. Increased pulse frequency and vascular tension are contraindications to conservative methods of treatment. In other words, instances of obstruction due to foreign bodies and fæcal impaction, when the constitutional condition is unaffected, may receive internal treatment, and patients in whom the obstruction is manifestly due to strangulation or volvulus should be put into the hands of the surgeon at once.

The question as to how long unsuccessful medical treatment may be continued is also important. The answer to this naturally depends upon the same factors as does the decision as to whether or not medical means are justifiable, namely, upon the patient's condition. It may be definitely stated that surgical interference should be delayed not longer than three days at most, and may become indicated after a much shorter period should the heart and circulatory apparatus exhibit symptoms of weakness.

Having decided that internal treatment may be employed there remains the decision as to of what this may consist. The means suggested for the medical management of intestinal obstruction have been many and of these the most approved will be discussed.

Drugs. Opium is opposed by many, and especially by surgical authorities on the ground that it induces an apparent improvement and obscures symptoms, which, if unaffected by the drug, would indicate operation; consequently opium should be given only in the earliest stages, when the pain is unendurable and when a probable diagnosis is impossible. Here a hypodermatic injection of one-fourth to one-third of a grain (0.015 to 0.02) of morphine sulphate is admissible. Following this a second dose may be given if no relief is experienced.

Atropine recently has been advocated in the treatment of ileus but statistics are insufficient to justify any positive statement as to its efficacy. The principle on which it has been administered is based upon its supposed antispasmodic effect upon the intestinal musculature. It may be given in moderate doses, one one hundred and twentieth to one-sixtieth of a grain (0.0005 to 0.001) and hypodermatically three or four times in twenty-four hours.

Purgatives are distinctly contra-indicated in intestinal obstruction unless an absolutely certain diagnosis of fæcal impaction can be made. In the latter case laxatives may be given; of these perhaps calomel in repeated doses of one-fourth to one-half a grain (0.015 to 0.03) is to be preferred. Treatment by high rectal injections of warm water in considerable quantity, retained as long as possible and repeated, frequently if necessary, is also indicated. Low rectal impactions may be removed by the finger or a blunt instrument.

Metallic mercury in large amounts is an old form of treatment but one which is dangerous and consequently should be employed with the utmost caution if at all.

Gastric lavage should be employed in all patients, even in those to be immediately operated upon. In these latter by this means the possibility of vomiting during anæsthesia is greatly lessened. The lavage relieves the distressing vomiting and has been known to relieve the obstruction. One should not be content with one washing, but the process should be frequently repeated to disembarass the stomach of the often rapidly regurgitated intestinal contents. The good effect of this procedure is more marked in obstruction of the small intestine. Rectal enemata are of value in obstruction due to fæcal impaction and intussusception. They may also be employed in other forms of acute occlusion in the hope that the resulting stimulation of peristalsis may cause a reduction of the ileus. Enemata of ice water are a more active peristaltic stimulant than those of warm water but must be given with care, especially if there is any tendency to collapse. Irritating solutions have been recommended in invagination, especially solutions of salt (five to eight percent.) and good results are reported from their use. Inflation with air (*see* p. 448) may also be found advantageous.

Massage should be employed only in intussusception and fæcal impaction and here only with the greatest care. It is distinctly contra-indicated when peritonitis is suspected and in patients in whom the obstruction is of long standing, since here there is a possibility of gangrenous conditions which may easily be ruptured.

Electricity—chiefly the faradic current with both poles applied to the abdomen—may prove effectual in stimulating peristalsis in instances of fæcal accumulation, and is said, at times, to exert a beneficial influence in volvulus. It is, however, a method of treatment of little importance.

The application of cold and warm compresses or poultices to the abdomen may relieve the patient's pain to some extent but is absolutely useless as a method of treatment of the lesion itself.

Diet. In acute intestinal obstruction no food whatever should be allowed. The thirst may be relieved by sucking bits of ice or better by frequently injecting small quantities of brandy and water into the rectum or by enemata of water at body temperature, since when ice is allowed to dissolve in the mouth the patient is continually swallowing water in unknown amount. There is no contra-indication to frequent rinsing of the mouth.

The collapse, if present, may be combated by hypodermatic stimulation.

A description of the technique of the surgical operations adapted to the radical treatment of intestinal obstruction is beyond the scope of a work of this character.

ENTEROPTOSIS.

This subject has already been considered in the section on Visceroptosis (see p. 403).

CONSTIPATION.

Synonyms. Costiveness; Coprostasis.

Definition. Infrequent or difficult evacuation of the fæces.

The normal human being should have, as a rule, one intestinal evacuation every twenty-four hours. There are, however, individuals, apparently in perfect health, who habitually have a movement of the bowels only every other day, while certain others regularly go to stool twice each day.

Pathology. *Post mortem* examination of the bodies of persons who during life have suffered from habitual constipation reveals no characteristic lesion.

Ætiology. Constipation has manifold causes. Among the factors that are potent in producing the condition are:

(a) Insufficient peristaltic action of the intestinal wall. This is a result of atony of the large intestine, which condition is often brought about by suppressing the inclination to go to stool, by chronic intestinal inflammations, the wasting diseases, and lack of muscular exercise.

(b) Dryness of the intestinal contents resulting from deficiency in the secretion of the intestinal fluids, especially the bile.

(c) Weakness of the muscles of the abdomen due to over-stretching of these structures as in conditions of obesity, after pregnancy, etc.

(d) Errors in diet. Foods leaving little undigested residue behind, such as milk, concentrated meat soups and jellies; tea and claret, because of their content of tannic acid, are prone to cause constipation, especially when little water, which taken in proper quantity moistens the intestinal contents and

- (a) Error in Diet
- (b) Insufficient peristalsis
- (c) Dryer etc
- (d) Weaker etc

Arrange treatment in
same order as

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increases secretion, is drunk. Indigestible foods, irregular meals, and insufficient mastication also increase any tendency to costiveness.

(e) Partial stenoses of the bowel caused from within or from without by the pressure of displaced organs, abdominal effusions, peritonæal bands or adhesions interfere with the normal passage of fæcal matter.

Symptoms. These may be indefinite or unrecognizable but, in a considerable number of patients, the condition results in a variety of manifestations such as a coated tongue, bad breath, lack of appetite, headache, torpor and poor digestion. Uterine and ovarian troubles are accentuated by constipation, and pressure on the veins of the rectum by the masses of hardened fæces often causes hæmorrhoids.

Diarrhœa, especially in the aged, may co-exist, since loose stools caused by irritation from the fæcal masses, may make for themselves a passage through or by the side of the impaction.

Treatment. Each patient should be separately studied and the cause of the constipation, if possible, ascertained. This having been done the treatment becomes simple. When diet and regulation of the patient's habits can be relied upon to relieve the condition drugs should not be employed.

The patient should be advised to go to stool at a certain hour each day no matter if there is no inclination on the part of the bowels to move, for, if the intestine acquires the habit of evacuating itself at a regular time, frequently the mere act of sitting upon the stool will induce a movement. He should also be advised always to heed any inclination to defæcate, at whatever time it may occur.

A regular course of muscular exercise should be prescribed, especially for individuals who are accustomed to a sedentary life. The daily use of light dumb-bells or the so-called "setting up" exercises are very efficient; such movements as bending backward and forward from the hips, rotating the body from the hips, rising to a sitting posture, with the lower limbs fixed, while lying down, etc., are an excellent means of strengthening the abdominal muscles and restoring the tonus of the intestinal muscularis. Bicycling, horseback riding, golf and tennis are to be recommended.

The diet should consist to a great extent of such foods as leave behind a considerable undigested residue, such as fruits of all kinds, eaten with the skins when this is possible, and the green vegetables. Brown or whole wheat bread is preferable to white, and gingerbread may be found useful in children. Honey is laxative as also is molasses. Highly seasoned foods, milk, eggs, pastry and fried foods are constipating. A considerable quantity of water should be taken daily; a glass should be drunk while dressing in the morning and another at night before retiring, with several more during the day. Tea and red wines should be forbidden. Coffee as well as beer and cider may be allowed.

Medicinal treatment should, as far as possible, be avoided, but it is often

found necessary to employ the milder laxative drugs. Of these rhamnus purshiana holds the first place. Its chief advantage is that, less than other drugs of this class, its continued use is likely to necessitate increased dosage, owing to the establishment of a tolerance on the part of the patient; in addition it has a tonic effect upon the intestine. Its great disadvantage is its very unpleasant taste, but this can be obviated by its exhibition in tablet form and by the use of various palatable preparations which may be procured. The dose of the fluidextract is from one-half to one drachm (2.0 to 4.0) or more given at night before retiring. It is more effective if given with an equal quantity of glycerin. Its employment may be continued for a considerable period the dose being gradually lessened as the tendency to constipation disappears. Aloes or its active principle aloin is another excellent drug of the same class. It may be given in various combinations of which the following example may prove useful. \mathcal{R} aloini, resinæ podophylli, extracti belladonnæ, of each gr. $\frac{1}{8}$ (0.008); make one pill. This pill taken at bed time usually brings about a natural movement the next morning, and owing to the belladonna seldom causes griping. Hyoscyamus has the same action in this regard and may be substituted.

The list of formulæ for laxative pills might be made almost interminable but it is needless to suggest more than the following: \mathcal{R} extracti colocynthis compositi, gr. i (0.065); extracti rhei, gra. iii (0.20); extracti hyoscyami, gr. $\frac{1}{2}$ (0.03); or \mathcal{R} aloini, gr. $\frac{1}{4}$ (0.004); strychninæ sulphatis, gr. $\frac{1}{8}$ (0.001) extracti belladonnæ, gr. $\frac{1}{8}$ (0.008); or \mathcal{R} extracti rhamni purshianæ, gra. ii (0.12); resinæ podophylli, gr. $\frac{1}{8}$ (0.008); extracti hyoscyami, gr. $\frac{1}{2}$ (0.03). Often four grains (0.25) of extract of ergot taken night and morning is sufficient.

For patients who cannot, or who think they cannot, swallow a pill the time-honored mixture of rhubarb and soda combined with fluidextract of rhamnus purshiana, five minims (0.30) to each teaspoonful (4.0) may be prescribed. A drachm (4.0) of this compound before each meal often gives good results.

Agar-agar in half-ounce (15.0) doses taken morning and night, eaten like a breakfast cereal, with milk or cream, not only relieves the symptom of constipation but may be curative after a few weeks. The use of this substance is based upon the fact discovered by Mendel that a considerable number of unusual carbohydrates, such as are found in many sea weeds, are not attacked by the digestive enzymes. Gompertz found that clinically there was a pronounced increase in the volume of fæces, the evacuations were well formed and of a dough-like consistency instead of the small, hard, dry scybalous masses, previously passed. After regular movements of the bowels are secured the quantity is gradually reduced. Owing to the imbibition and retention of water the bulk becomes large and thus increases peristalsis and further this substance is able to resist the action of intestinal bacteria.

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Synthetic purgatives, such as phenolphthalein, are useful. This, given in tablet form with chocolate is willingly taken by children since its taste is pleasant, and is said to bring about no unpleasant after-effects. The usual dose is, for an adult, two grains (0.12) but from one to ten grains (0.065 to 0.65) may be the proper one for a given individual. This is a disinfectant of the intestine, does not dissociate in the bowel nor is it absorbed. Eight years' use of it has demonstrated its value in many instances.

When an atonic condition of the bowel is present physostigmine salicylate in dosage of one-sixtieth of a grain (0.001) may be given separately or added to one of the above formulæ.

Compound licorice powder in drachm (4.0) doses is often useful.

The stronger purgatives such as castor oil, calomel and the various salines are admissible only when the intestine is clogged with fæcal matter that requires immediate removal.

Laxative mineral waters should not be taken habitually as a rule but in obesity, chronic purinæmic conditions and hepatic cirrhosis their occasional use is of advantage. The waters to be recommended are Carlsbad Sprüdel, Hunyadi, or Apenta, Villacabras, that of Bedford Springs, Pennsylvania, and Saratoga Congress water.

The treatment of constipation at the various spas is unsatisfactory. During the patient's sojourn at the water cure the regular life, exercise and restricted diet, together with the water drunk, regulate the bowels but on returning home the cure is found to be by no means permanent.

The continued treatment of constipation by enemata is not to be recommended. An injection is, however, a most approved means of removing fæcal impactions and managing the attacks of obstipation that at times occur in the course of chronic states of constipation.

The injection may consist of lukewarm water or of soap suds. If these are ineffectual, the condition can probably be relieved by an enema of eight ounces (250.0) of olive or cotton seed oil, two ounces (60.0) of castor oil, rectified oil of turpentine, one-half an ounce (15.0) to the pint (500.0) of warm water or, if the impaction is particularly obstinate, a mixture of one drachm (4.0) of ox gall in a pint (500.0) of water.

Rectal enemata should be given, from a fountain syringe suspended four or five feet above the patient, and through a soft rubber rectal tube passed high into the rectum. The Davidson syringe if employed should be used with great care, especially in children, for if too great force is exerted there is danger of intestinal rupture.

Impactions low in the rectum may be relieved by means of suppositories of glycerin or such as the following: \mathcal{R} glycerini, \mathfrak{m} iii (0.2); pulveris aloes, gr. $\frac{1}{2}$ (0.02); extracti belladonnæ, gr. $\frac{1}{4}$ (0.016); olei theobromatis, q.s. ad gra. xv (1.0).

Massage of the abdomen is an excellent adjunct to treatment and may be

performed either by a nurse or the patient himself. The manipulation should be commenced in the region of the splenic flexure of the colon and carried on along the descending colon toward the rectum; then beginning at the hepatic flexure the endeavor should be made to unload the transverse colon; finally the cæcum and ascending colon are *masséed* and the *séance* is ended by traversing the whole colon from ileo-cæcal valve to sigmoid flexure. The patient also may be instructed to percuss his abdomen with the ulnar border of the hand along the course of the large intestine for a number of minutes night and morning. A vigorous course of treatment of this character may succeed where drugs have failed. Rolling a two pound (1000.0) cannon ball, covered with leather, upon the abdomen for five or ten minutes every morning has been recommended. The course should follow ascending, transverse and descending colon, across lower abdomen to starting point.

Hydrotherapeutic measures such as vigorous friction baths, cold or alternate warm and cold spinal douches, hip baths at 50° to 68° F. (10° to 20° C.) of from two to five minutes' duration once or twice a day and a wet abdominal compress at 50° F. (10° C.) on retiring are approved additions to general hygienic treatment.

Electricity in the form of the faradic current may be employed with the object of causing short colonic contractions. One electrode may be applied to the back while the other is pressed deep into the addomen. The abdominal electrode should not be held stationary for any length of time, but its situation should be rapidly changed. Static electricity in the form of the wave, or the static induced current, is useful, the former in mild constipation, the latter in obstinate chronic instances. When the static wave-current is used but one pole is in contact with the patient, the other being grounded or not; if the latter, the treatment is milder than when the former is the case. The current is transmitted to the patient either through a rectal electrode or a flat electrode applied to the wall of the abdomen, its strength being regulated by the spark-gap between the sliding poles.

In using the static induced current the patient is connected with the outer surface of the Leyden jars, their inner surfaces being connected with the poles of the machine. One electrode is placed upon the back, the other in the rectum, or both are applied to the back.

The treatment of constipation in infants is dietetic when it is possible to combat the condition by this means. Fortunately in breast-fed babies the condition is rare. In bottle-fed children the regulation of the proper proportion of fat and proteid will overcome the difficulty. Very often raising the fat percentage or reducing that of proteid is all that is necessary. If the constipation is obstinate the use of an occasional teaspoonful of olive oil in conjunction with abdominal massage and, if necessary, the employment now and then of a suppository constructed of a cone of oiled paper may prove successful. Suppositories of soap or glycerin are irritating to the rectum but those

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of gluten do not possess this disadvantage and may at times be used with benefit. If laxative medicines are necessary young infants may be given a few grains of sodium phosphate or a teaspoonful or two of milk of magnesia may be added to the last bottle at night.

The management of constipation in older children should be carried out along the same lines as those suggested in its treatment in adults; the establishment in early life of a regular habit of going to stool is most important.

COLITIS.

Most of the diseases of the colon are caused by infections and are considered among the infectious diseases (*see* Dysentery, p. 75).

Mucous colitis has already been considered (*see* p. 420).

DILATATION OF THE COLON.

This condition occurs in both an acute and a chronic form; the first as a result of acute obstruction, being either distended with gas or solid matter, the second as a sequel of chronic constipation or atony of the bowel. Idiopathic colonic dilatation is also observed, most commonly in children, as a congenital defect. Here it usually affects the descending portion or the sigmoid flexure and is a factor in the production of constipation later in life. The sigmoid flexure and the lower fourth of the descending colon are sometimes the site of diverticula.

Pathology. Any part of the colon or its whole length may be dilated. In chronic instances the muscular coat may be thickened, in acute instances the whole intestinal wall may be thin as a result of stretching or atrophy. The diverticula, congenital or acquired, may if inflamed give rise to obstruction, perforation, abscess, gangrene, or rarely metastases (*Perisigmoiditis*.)

Symptoms. There is obstinate constipation, marked abdominal distention and often pressure upward upon the liver, spleen, and thoracic viscera. In the idiopathic form the bowel may often reach an enormous size. In severe instances the action of the heart and lungs may be greatly embarrassed, sudden death even having occurred as a result of interference with the heart. In more acute instances vomiting may be present. Examination reveals an abdomen greatly distended and markedly tympanitic, hepatic and splenic dulness often being obscured.

Treatment. This consists in relieving the constipation by high enemata, in obstinate instances, of oil or ox gall if necessary (*see* p. 455). These should be given in connection with drug medication given by mouth with a view to overcoming the obstructive condition from above. Having emptied the bowel, it remains to bring about as normal an intestinal action as possible. This may be accomplished by the administration of laxatives, castor oil now and then being very effectual, the prevention of distention by means

of antifermentives such as bismuth tetraiodophenolphthaleinate, five grains (0.30) with resorcinol, two grains (0.12), beta-naphthol fifteen grains (1.0) or bismuth naphtholate, ten grains (0.65).

The administration of physostigmine salicylate—one one-hundredth of a grain (0.0006) or of strychnine sulphate—one-thirtieth of a grain (0.002) is useful in restoring the normal tonicity of the bowel.

One should always make a digital exploration of the rectum, for manual removal of fæcal impaction is often necessary.

The diet should be easily digestible, such as to cause as little fermentation as possible and composed of foods—meat in particular—that leave little residue behind.

Surgical procedures such as the formation of an artificial anus or resection of considerable portions of the bowel, when indicated, have given good results.

NERVOUS AFFECTIONS OF THE INTESTINES.

Of these we may distinguish three types: (a) *Motor disorders*. (b) *Sensory disorders*. (c) *Secretory disorders*.

Of *motor disorders* there are four classes:

1. Increased peristaltic activity of both small and large intestine resulting in the so-called nervous diarrhœa; there is also probably an increased intestinal secretion as well. The condition is seen most often in neurotic and hysterical patients and after unusual mental shocks, such as may be caused by sudden fright, joy, etc. This is a frequent symptom of the menopause. There is no pathological change in the intestine; the attacks of diarrhœa appear without warning and may cease suddenly. The stools vary in frequency from two to fifteen or twenty during the day and are composed of thin watery matter, mucus being seldom present and blood still more rarely. During the defæcation there may be a considerable expulsion of gas, tenesmus and intestinal rumblings.

2. Peristaltic unrest or *tormina intestinorum* chiefly involves the small intestine and consists of peristaltic waves passing from one end of the bowel to the other and carrying with them whatever of gas or fluid may be present. The condition occurs both in neurotic and in perfectly healthy subjects and concerning its cause we can but advance the theory that it is the result of a hyper-excitability or an increased activity on the part of the nervous mechanism which presides over peristalsis.

The excessive peristalsis may follow emotional shocks, occur at the menstrual epoch or without assignable cause. An attack usually lasts but a few minutes but may be prolonged for hours. It is evidenced by very perceptible rumbling and gurgling sounds in the abdomen, varying in intensity. Pain is rare but the patient is usually distressed because of the embarrassing amount of attention attracted by the affection.

Consider also intestinal
that form of analgesic
paralysis analogous
To acute paralytic
dilatation see
Kemp's paper
referred to under
that title

Intestinal paralysis
also treated by
physostigmine
Salicylates
 $\frac{1}{12}$ -gr. (0.001) 1-3 times
daily

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3. Nervous cramp or enterospasm is an obscure affection consisting of a contraction of the intestine limited to a small portion of the bowel or involving a considerable length of this structure. The spasm is characterized by pain lasting for variable periods; there may be localized distention of the bowel.

4. Intestinal paralysis apparently results from over-irritation of the inhibitory nerves of the intestinal muscularis which may finally undergo atrophy. The condition, when chronic, produces habitual constipation.

▲ **Treatment.** This of the increased peristaltic activity consists in the employment of means calculated to combat the nervous and hysterical states from which the condition results. Constipating drugs have no effect. Success is likely to attend the prolonged use of the bromides and arsenic, together with the regulation of the mode of life and attention to general hygiene.

Of the treatment of peristaltic unrest the same can be said as regards general management; spa or institutional treatment, with electricity and hydrotherapeutic procedures as adjuncts, often achieves good results. With regard to drugs, arsenic, the bromides, valerian, codeine and belladonna have been recommended, with hydrated chloral and opium as last resorts. These last two must be used with great care lest the patient become a drug habitué.

In enterospasm all methods of treatment which increase intestinal irritability, such as electricity, massage, cold applications and the like, must be avoided. Marked constipation occurring with this condition should be relieved by oil injections, and the local application of warm compresses and the employment of warm baths are approved methods of treatment. The administration of various drugs has been suggested with the view to lessening the irritability of the intestine; of these opium, belladonna, acetphenetidine (phenacetine) and antipyrine may be mentioned.

Intestinal paralysis should be treated by the administration of strychnine sulphate in considerable doses—one-thirtieth to one-twentieth of a grain (0.002 to 0.003)—three times a day, and by other measures calculated to stimulate and restore the tone of the intestinal musculature, such as massage and electricity.

Sensory disorders. ▲ Intestinal neuralgia is a painful affection resulting from a hyper-sensitiveness of the sensory nervous mechanism of the bowel. The condition is distinct from the pain of true colic and is seen in nervous and hysterical individuals, certain nervous diseases, especially locomotor ataxia (tabetic intestinal crises), in gouty conditions and as a result of chronic plumbism. The pain is general, involves the whole abdomen, and is of extremely severe type, increased on pressure. It is not accompanied by fever. Its diagnosis is very difficult, there being so many painful abdominal affections from which it must be differentiated that at times an exploratory laparotomy is the only means by which the condition can be certainly diagnosed.

Intestinal hyperæsthesia or abnormal sensations in the bowel occur in hysterical and neurasthenic patients. Of these there is a great variety ranging from feelings of fullness, tickling or throbbing to severe burning or stabbing pain. The condition is the result of some disorder of the central nervous system or of a local derangement of the intestinal innervation.

Treatment. Of both these conditions this resolves itself into the proper management of any neurotic tendency which may exist, by means of general measures such as the rest cure, institutional or spa treatment. Belladonna may afford relief; opium should never be given on account of the danger of habit formation. Sensory disorders due to tabes, gout or plumbism should receive the treatment which their causes indicate.

Secretory disorders are the result of vaso-motor derangements and are very difficult to separate from abnormalities of motility and sensation, in fact these conditions often occur simultaneously. Certain influences, however, may cause excessive outpouring into the bowel of large quantities of serous or mucous fluid. The management of such conditions has been discussed under the treatment of nervous diarrhœa (see p. 459).

NEOPLASMS OF THE INTESTINE.

Carcinomata may occur in any part of the bowel. They involve, in by far the majority of instances, the rectum, are much less common in the colon and are very rare in the small intestine. Various types of cancer have been observed; those most frequently seen in the small intestine are cylindrical celled epitheliomata or adeno-carcinomata and the most usual site of the neoplasm is in the duodenum near the opening of the bile-duct. In the colon we find cylindrical celled epitheliomata; the situations most frequently involved are the caput coli and the sigmoid flexure. In the rectum malignant new growths are of more varied type, colloid, scirrhus and soft carcinomata as well as epitheliomata of the squamous celled type commonly existing in this situation; sarcomata including the melanotic variety are much more rare but do, at times, occur.

Symptoms. These are by no means typical. The usual cancerous cachexia is usually present, if not at first, at least in the later stages. To this may be added the symptoms of partial obstruction such as pain, nausea, rarely vomiting and especially constipation, with the presence of a tumor. This last varies in size and situation, is usually firm in consistence, irregular of surface and generally sensitive to pressure. It is frequently movable, but this is not always the case. It is dull on percussion and may seem to pulsate if it is situated over the aorta. Masses of fæcal matter lying above it in the bowel may obscure the tumor but the administration of irrigations or laxatives will remove these, after which the true character of the lesion will become apparent.

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In cancer low in the rectum digital examination or inspection by means of the proctoscope will reveal the presence of a malignant obstruction.

The bowel movements are constipated in character as a rule but may be otherwise normal in rare instances. If the neoplasm is in the rectum they are likely to be ribbon- or pencil-shaped as a result of the stenosis. They may contain blood and more or less foetid pus, the former both before and after ulceration has taken place, the latter after this event only. The presence of mucus signifies little else than that an inflammatory condition of the intestinal lining is present; the occurrence, however, of sanious pus or muco-pus is of extreme importance from a diagnostic point of view since these appear only in intestinal cancer, in ulcerative colitis and as a result of the rupture of an abscess into the lumen of the bowel. The large amount of the pus in the last case and the unlikelihood of colitis being mistaken for malignant intestinal tumor simplify the differential diagnosis of cancerous conditions. The importance of digital rectal examination, however, in all suspicious instances cannot be over estimated.

Diagnosis. The separation of duodenal cancer from pyloric carcinoma is difficult, the presence of jaundice, lack of early dyspeptic symptoms and normal acidity of the gastric contents pointing to, but not rendering certain, the existence of the former condition.

Floating kidney is movable and its shape may be recognized. Floating spleen is less likely to give rise to error. Ovarian tumors, particularly dermoid cysts, are usually identified upon careful physical examination.

Prognosis. This is always unfavorable, exceptionally resection has been made with fair success and life has been prolonged and made more endurable by the formation of an artificial anus.

Non-malignant tumors of the intestine, such as *polyp*, *fibromata*, *angiomata*, etc., may exist without causing symptoms; they may, on the other hand, produce symptoms resembling those of malignant, growths such as stools containing mucus and blood; there is no resulting cachexia and the neoplasm may be seen or felt upon rectal examination.

Treatment. This consists in removal of the growth by surgical procedure when this is possible. The operation indicated varies with the condition present. Resection of the bowel, without the formation of an artificial anus, has prolonged life and excellent results may be achieved in favorable instances by rectal resection. Return sometimes does not follow the removal of a rectal cancer.

When surgical intervention is for any reason decided against, the patient's general condition should receive attention. His nourishment should be maintained by the administration of easily digested foods given by the mouth or *per rectum*, and stimulants should be prescribed when necessary. The possibility of obstruction by faecal matter should be provided against by regulation of the bowels so that a sufficient movement is obtained each day.

PROCTITIS.

Proctitis or inflammation of the mucous lining of the rectum occurs in various types, usually as a part of co-existing colonic inflammation. Gonorrhœal proctitis may occur as the result of unnatural practices. For a description of these conditions and their treatment the reader is referred to the sections upon dysentery, entero-colitis and intestinal ulceration.

HÆMORRHOIDS.

Synonym. Piles.

Definition. Hæmorrhoids is the term employed to designate a varicose condition of the veins of the lower rectum. Their most frequent situation is at the muco-cutaneous junction at the anal orifice.

Hæmorrhoids are internal or external depending upon whether they are developed within the sphincter ani or outside this muscle.

Pathology. The hæmorrhoidal tumor is composed of dilated blood-vessels, of clots beneath the mucous membrane or of the muco-cutaneous integument of the anal region. It is seldom single; more frequently there are two or more. In shape they are spherical or ovoid, of the size of a small pea to that of a good sized grape or even larger, in color they are reddish or purple, their surface is smooth or lobulated, and in consistency they vary from soft and fluctuating to firm and tense. On section they are found to be filled with venous blood and if of long standing the cavity of the tumor may be intersected with a reticular growth of connective tissue.

Ætiology. Hæmorrhoids are predisposed to by the erect posture of the body and the anatomical arrangement of the structures involved; the fact that hæmorrhoidal veins drain into both the general and the portal venous circulation renders the occurrence of piles common in conditions involving venous obstruction, such as cardiac lesions, hepatic cirrhosis, etc. Hæmorrhoids are common in both men and women; the former seem to be more frequently affected than the latter, although this may be the result of the natural disinclination of the female sex to consult a physician concerning such a condition.

Chronic constipation is a common predisposing cause of hæmorrhoids, the hard fæcal masses pressing upon the veins of the rectum and rendering free circulation difficult. Pelvic tumors, uterine displacements, etc., act in the same manner and have the same result hæmorrhoids are a common and often very distressing complication of pregnancy. The tendency of the menstrual flow to relieve congestion of the pelvic region is likely, on the other hand, to militate against the production of piles.

Hæmorrhoids are also predisposed to by the wearing of over-tight clothing about the waist, by over-eating and drinking and by sedentary habits.

Symptoms. Piles may exist for long periods without causing symptoms.

Should an external hæmorrhoid become congested for any reason the first symptom is pain in the region of the anus, accompanied by sensations of tingling; these increase until sitting becomes impossible and a movement from the bowels is attended with excruciating agony. Examination reveals one or more purplish tumors at the anal margin, hard and tense and excessively tender. The tumor may gradually disappear and the symptoms abate, abscess formation may ensue and spontaneous cure result after rupture and discharge of the pus, or the circulation being cut off by the engorgement, the hæmorrhoid may ulcerate off. At any time inflammation may recur with its attendant symptoms. Recurrent hæmorrhage from the tumors is not infrequent and is not harmful provided not too much blood is lost.

Internal piles may be single or multiple. The symptoms produced by them are a feeling of fulness or tenesmus in the rectum, with dull aching pain and perhaps a mucous rectal discharge. Engorgement with symptoms corresponding to those of external piles may at any time appear and hæmorrhage is not uncommon; this latter may relieve the discomfort but at times so much blood is lost as to jeopardize the health of the patient.

Treatment. This consists in attention to any causative factor in the shape of cardiac, hepatic or pelvic disease, the securing of a normal movement of the bowel each day (*see* the treatment of constipation, p. 453) and careful daily cleansing of the parts by means of soap and warm water. Painful hæmorrhoids when not acutely engorged may be relieved by various astringents such as liquor ferri subsulphatis; this should be applied two or three times daily with a brush. Ointments such as the following are often effectual: \mathcal{R} unguenti stramonii, unguenti belladonnæ, \mathfrak{aa} \mathfrak{Z} ii (8.0); unguenti gallæ, \mathfrak{Z} iv (15.0); or \mathcal{R} extracti suprarenalis, \mathfrak{Z} ii (8.0); adipis lanæ hydrosi, \mathfrak{Z} vi (24.0). These ointments should be applied generously to the affected part, a wad of cotton should be fitted over the anus and held in place with a T-bandage.

Inflamed and engorged piles may be relieved by holding a piece of ice in contact with the tumors, by spraying them with a jet of cold water or by applying a compress of gauze impregnated with glycerite of boroglycerin or by ointments such as the following: \mathcal{R} morphinæ sulphatis, gr. x (0.65); unguenti belladonnæ, unguenti stramonii, \mathfrak{aa} \mathfrak{Z} iiss (6.0), ichthyolis, \mathfrak{Z} v (20.0); or \mathcal{R} morphinæ sulphatis, gr. iss (0.1); acidi tannici, \mathfrak{Z} ss (2.0); picis liquidæ, \mathfrak{Z} ss (2.0); cerati, \mathfrak{Z} ss (2.0); adipis benzoinati, q.s. ad \mathfrak{Z} i (30.0).

The treatment of piles which are not protruded is practically identical with that already given. The difficulty of applying ointments to the tumors within the sphincter may be obviated by the use of the "pile pipe," an instrument adapted to the injection of semi-solid materials, and the employment of suppositories; of these the following excellent examples are worthy of trial: \mathcal{R} ichthyolis, acidi tannici, \mathfrak{aa} gr. v (0.30); extracti belladonnæ, gr. $\frac{1}{2}$ (0.030); extracti hamamelidis, olei theobromatis, q.s. ad gr. xv (1.0). Fiat

suppositoria; R̄ iodoformi, gra. v (0.30); olei theobromatis, gra. x (0.65). Fiat suppositoria.

Hæmorrhage from protruded piles may be controlled by the application of a wad of cotton thoroughly impregnated with iodoform, powdered suprarenal extract, powdered calomel, bismuth subgallate or aristol, or a compress saturated with a ten percent. solution of calcium chloride; bleeding from the non-protruded variety may be stopped by the injection of five drachms (20.0) of ten percent. calcium chloride solution or the introduction of suppositories such as the following: R̄ extracti suprarenalis, gra. v. (0.30); olei theobromatis, gra. x (0.65).

For a description of the treatment of hæmorrhoids by injection and radical surgical measures, which are indicated when medicinal treatment fails, the reader is referred to works upon rectal diseases or upon surgery.

DISEASES OF THE LIVER.

ABNORMALITIES OF THE LIVER.

The abnormality in the shape of the liver which is the most common and important is the result of the constriction of tight waist bands or corsets, the so-called "corset liver." The deformity consists of a division of the right lobe into two parts by a transverse groove of varying depth. At times the furrow is so deep that the right lobe is divided into two more or less equal portions by a tendinous band. The symptoms which ensue are usually unimportant, the chief interest of the condition lying the fact that in the lower division of the lobe, which often reaches to the umbilicus and may extend as low as the iliac crest, is likely to be mistaken for an abdominal tumor or a misplaced kidney; its margin, however, in most instances, is continuous with that of the left lobe of the liver and the displaced organ descends with inspiration. If the intestine lies in the groove and is tympanitic upon percussion there is an added difficulty in the differentiation of the condition. The symptoms, if any, are those incident to the dragging down of the tumor, and nervous manifestations, such as those caused by a movable kidney, may be present. At times the corset liver lies almost entirely above the costal margin, it is narrower above than below and the transverse furrow is just superior to the lower margin of the organ. These deformities of the liver are said to offer an obstruction to the normal flow of the bile and consequently to predispose to the formation of hepatic calculi.

Abnormalities of Position. The liver may be upon the left side of the abdomen in instances of visceral transposition. Not uncommonly is the organ tilted forward so that, although there is no increase in size, the lower border may be palpable below the costal margin. This tilting may be so extreme that the vertical diameter of the organ may become horizontal. The

liver may also be displaced upward by the pressure of abdominal growths or by peritonæal effusions and downward by fluid in the right pleural cavity or by the expanded lung of emphysema.

The movable liver is a rather rare condition, which may be caused by tight-lacing and also may occur as a part of a general visceroptosis. The displacement of the organ may be slight only or so considerable that the entire liver may fall below the edge of the ribs in which case the coronary and suspensory ligaments are so elongated as to form a mesohepar.

Physical examination in instances of marked hepatoptosis reveals an absence of the normal liver dulness and the existence of a tumor having the size and shape of the liver in the abdominal cavity below the normal position of the organ. The tumor is usually freely movable and may be replaced if the patient assumes the recumbent position.

Symptoms. Those usually observed are analogous to those of movable kidney, namely a dragging sensation in the abdomen together with the nervous manifestations which so often are associated with nephroptosis. In a considerable proportion of instances jaundice with pains resembling those of hepatic colic occurs.

Treatment. This consists of the application of a properly fitting belt or bandage calculated to hold the organ in place. When the hepatoptosis is a part of a general ptosis of the abdominal viscera the treatment is that of the visceroptosis (*see* p. 403).

PERIHEPATITIS.

Synonym. Capsular Cirrhosis.

Definition. A localized peritonitis involving that portion of the peritonæal membrane which surrounds the liver.

Ætiology. Perihepatitis is observed as a result of extension of some hepatic inflammation such as abscess; in association with a general peritonitis; as an extension of a pleuritic inflammation through the diaphragm; as a result of traumatism; or as a result of perforation of the stomach, intestine or gall-bladder. It has also been considered as due to an arterial nephritis.

Pathology. Fibrinous perihepatitis is characterized by the exudation of fibrin upon and the formation of adhesions of the peritonæal covering of the liver. These adhesions may, in the purulent type of the inflammation, encapsulate collections of pus between the liver and the diaphragm (*sub-diaphragmatic abscesses*) which may ultimately perforate upward into the pleural cavity.

In the chronic form the inflammation consists of a marked thickening of the entire capsule of the liver with consequent contraction and diminution in the size of the organ which, however, is itself seldom the seat of a cirrhosis. The thickening is often extreme at the hilum of the liver and there may be

stenosis of the blood-vessels and bile ducts at this point; adhesions to surrounding structures are very common.

Symptoms. These are often not in the least characteristic and frequently the condition is unsuspected during life; pain over the hepatic region may be present. In some instances the symptoms are those of atrophic cirrhosis with recurrent ascites but no jaundice. Physical examination may reveal the presence of a friction sound over the liver or over the epigastric region when there is marked general capsular thickening. When there is a purulent exudate between the diaphragm and the liver there is also a septic temperature with chills and sweating; the lower ribs of the right side may be forced outward and the physical signs of pleuritic effusion may be present with flatness and absence of voice, breathing and vocal fremitus even as high as the angle of the scapula. Rupture of the pus cavities may take place upward into the pleura, into the abdominal viscera or outward through the skin.

Diagnosis. Between suppurative perihepatitis and pleuritic effusion this is sometimes difficult but the early symptoms of the former are abdominal rather than thoracic. The liver is displaced further downward in the former condition. Aspiration may be of assistance in differentiation and it has been stated that the pressure of the out-flowing fluid is increased during the descent of the diaphragm with inspiration in subphrenic abscess while in effusion into the pleura the opposite is the case.

The non-purulent perihepatitis with localized thickening is seldom recognized during life.

Prognosis. In the suppurative types this is unfavorable; the localized thickenings of the hepatic peritonæum are not prejudicial to life.

Treatment. In the more acute instances of perihepatitis before pus-formation the patient should be kept in bed on a light diet. The pain may be relieved by counter-irritation in the form of hot compresses, mild mustard poultices, cupping or leeching. The application of straps of adhesive plaster will lessen the movement and prevent stretching of the adhesions but has the disadvantage that the interference with motion tends to permanency of the adhesions.

When pus is present surgical measures should be immediately undertaken with its evacuation in view.

The intake of fluids should be limited, depletion by purgatives and diuresis may be given a trial. Inunctions of ten percent. iodine in vasogen may be prescribed in the hope of causing absorption of the peritonæal proliferations. Large accumulations of ascitic fluid necessitate paracentesis. Repeated tapings are sometimes indicated. The treatment of ascites by means of operation will be discussed in the section upon the treatment of hepatic cirrhosis.

9
Chc. Minimal Pericarditis

Recurrent
Subacute Endocarditis
Sept. 1912

CHRONIC UNIVERSAL PERIHEPATITIS.

Synonyms. Panserositis; Pick's Pseudo-cirrhosis; Pericarditic Pseudo-cirrhosis of the Liver; Iced Liver; Zuckergussleber.

Definition. A chronic venous engorgement of the liver in patients suffering from adherent pericardium as described by Pick in 1896.

Ætiology. This condition occurs in young subjects with history of rheumatic pericarditis and endocarditis but without any of the antecedents of hepatic cirrhosis.

Pathology. The general condition is marked venous engorgement of the liver with some adhesions to the diaphragm, the surface is opaque, due to a fibrosis under the capsule. Under the capsule there is an atrophy of liver cells. In other cases this fibrosis is on the outer surface of the capsule,—the true zuckergussleber. There is generally found an adherent pericardium, also massive pleuritic adhesions, and frequently generalized fibrosis of the peritonæum with adhesions.

Symptoms. Local pain and particularly recurring ascites are the prominent symptoms. There is usually no or but slight jaundice; œdema of the lower extremities is absent. Frequently there are febrile attacks, preceded or not by chill, increased pain and later ascites.

Prognosis. This is unfavorable although the patient may live in comparative comfort for many years. Tuberculous peritonitis may supervene.

Treatment. This in the main is that of hepatic cirrhosis with ascites (see p. 475). However, so soon as the amount of ascitic fluid becomes burdensome it should be removed by paracentesis. Enormous quantities have been removed at short intervals, and later no reaccumulation has taken place and this absence of ascites has persisted for years. For the febrile attacks, antipyrine salicylate in sufficient doses is of great value. The cardiac symptoms must always be borne in mind. The diet should be generous.

ABSCESS OF THE LIVER.

Synonym. Suppurative Hepatitis.

Ætiology. Hepatic abscess is in all probability, in every instance, the result of microbic infection. The possibility of chemical insult to the organ, however, may be considered.

Infection of the liver tissue and subsequent abscess formation may result from a number of causes; of these the most frequent are:

1. Infection with the *amœba coli*. In most instances of this form of the affection there is a preceding tropical amœbic dysentery but amœbic abscess of the liver has been observed in the absence of symptoms referable to the intestine. Amœbic abscesses are usually single, of considerable size and as is natural, most common in tropical countries.

2. Pyæmic abscesses occur as a result of the lodgment in the blood-vessels of the liver of septic emboli. These are often multiple and usually of small extent. They occur in pyæmia, osteomyelitis, malignant endocarditis, ulcerative inflammations of the intestines, pelvic suppuration, peritonæal inflammations, etc.; when the primary suppurative process is in the area of the systemic circulation the infection is brought to the liver by the arterial system as a rule; more rarely it may be transmitted by means of the inferior cava and the hepatic vein.

3. Foreign bodies, such as hepatic calculi or parasites may set up an infective cholangitis which may proceed to abscess formation.

4. Tuberculous hepatitis may be characterized by the development of multiple abscesses.

5. The passage of foreign bodies from the œsophagus, stomach, or duodenum into the liver itself, where an abscess may result, or into one of the portal vessels, where an infective pyelephlebitis followed by an abscess may take place, is a rare cause of hepatic suppuration. Hydatid cysts of the liver are subject to infection and subsequent abscess formation.

6. Traumatism over the liver is a recognized cause of hepatic abscess and head injuries may be followed by the occurrence of this lesion.

Pathology. Abscess of the liver may be single or multiple. Large abscesses are most frequently situated in the thickest part of the right lobe, the cavity being sometimes so large as to involve the whole of this structure. The liver may be enlarged and, if the abscess is near the surface, a fluctuating swelling may be noted. The lining of the larger abscess cavities is usually ragged and their contents may be thin and fœtid or thick and viscid; the contents are often bile-stained, often contain cholesterin and bilirubin crystals. The pus of the amœbic abscesses usually contains the amœba coli. The pus of echinococcus abscesses contains the characteristic hooklets.

Pyæmic abscesses are usually small and multiple but they do not often communicate. They begin as a phlebitis which spreads to the adjacent tissues. The liver is enlarged but its external appearance may be unchanged; if the abscesses are near the surface there may be capsular inflammation and adhesions to neighboring structures. Superficial abscesses may be evidenced by the occurrence of yellowish spots upon the surface of the organ. In marked instances of suppurative pyelephlebitis the liver on section exhibits a number of small yellowish areas, rounded or branching, from which pus exudes on pressure. Careful examination will reveal the fact that these small abscesses communicate with the portal vein and are really branches of this vessel in a state of suppuration. Involvement of the entire portal system may be observed and the infecting process may extend into the mesenteric or gastric veins.

In the multiple abscesses of cholangitis the appearance of the liver is similar to that just described but the pus is in the bile ducts instead of in the

branches of the portal vein. Gall-stones and suppurative cholecystitis are often present.

Perforation of large abscesses into the pleura, lung or any of the adjacent viscera, into the peritonæal cavity or externally through the skin may take place.

Symptoms. These may be very indefinite; in rare instances death from rupture and general peritonitis may occur before there is suspicion of the true nature of the affection.

Elevation of temperature is quite constant, the curve being of the pyæmic type and reaching as high, in some instances, as 105° F. (40.5° C.). The fever is accompanied by irregular rigors and sweating, the latter often being marked during sleep. Fever may be slight or absent in chronic instances of the affection. Jaundice in varying degrees may be present but is a rather inconstant symptom. There is pain in the region of the liver or it may be referred to the shoulder or back. The patient is often more comfortable when lying on the right side. There is tenderness upon pressure over the liver especially at the margin of the ribs anteriorly. There may be a co-existent diarrhœa, especially in amœbic abscess, and the presence of the amœbæ in the passages is a great aid diagnosing the condition.

Perforation into any of the surrounding structures or through the skin may take place. Rupture into the lung is characterized by convulsive cough with the expectoration of sputum of reddish brown tint resembling anchovy sauce, and the signs of consolidation at the base of the right lung. The sputum may contain the amœba coli.

Physical examination reveals an increase in the size of the liver, usually of the right lobe, which is enlarged upward rather than downward. This enlargement is evidenced by an extension of the normal liver dulness upward; this is especially marked in the mammillary and mid-axillary lines. Large superficial abscesses may cause a bulging of the overlying surface and it may even be possible to detect fluctuation. Adhesions to the abdominal wall may take place and as a result of these fremitus may be elicited. The compressed lung, upon respiration, moves less than normally. In some instances of extreme hepatic enlargement the margin of the organ may be palpable below the costal margin; its surface is smooth and tenderness is often present.

The symptoms of the multiple pyæmic or pylephlebitic abscesses occur as part of those of a general pus infection. The pyæmic temperature, with its accompanying sweats and chills, is present and the skin may be jaundiced. There is pain in the hepatic region with tenderness on pressure and the liver is the seat of a uniform increase in size.

Diagnosis. Hepatic abscess may be confounded, for a time, with malarial fever but the absence of plasmodia from the blood and the inefficacy of quinine are sufficient to exclude the latter. Subphrenic abscess, either containing pus alone or both pus and gas, generally results from perforation

upward. The other causes of this condition must be kept in mind: they are most frequently appendicitis, next from the liver, somewhat rarely from the spleen, perforation of a duodenal ulcer, suppuration in or around the pancreas, from the Fallopian tubes, or retroperitonæal suppuration from the kidneys. To determine whether an abscess of this character is above or below the diaphragm two signs are important: (a) Fürbinger introduces an aspirating needle into the abscess cavity, which remains motionless on respiration if the abscess is above the diaphragm, but if it is below it moves with inspiration and expiration. (b) Pfuhl found that in subphrenic abscess into which a canula had been introduced the outflow of pus is greater during inspiration and less during expiration, the reverse of what obtains in instances of empyema. When upward perforation has taken place and the previous symptoms have not been characteristic the condition may be considered to be, in addition to those just cited, an empyema or a pulmonary abscess but the presence of the sputum resembling anchovy sauce and of the amœbæ renders the diagnosis simple.

Infected echinococcus cyst may be diagnosticated as abscess but its character is hardly recognizable unless hooklets are found in the aspirated pus. The employment of the exploring needle is to be advised in suspected abscess of all varieties but a failure to withdraw pus does not exclude the possibility of its presence. The needle should be of moderate calibre and the operation should be carefully performed under general anæsthesia. The usual points of puncture are over the point of maximum dullness, in the seventh interspace in the anterior axillary or mid-axillary line.

Hepatic intermittent fever due to the presence of calculi is associated with a history of biliary colic and the presence of more extreme icterus; in other respects, such as in its temperature curve, chills, sweating and liver tenderness, it may resemble the more serious condition of abscess.

Acute pancreatitis may simulate an abscess in the left lobe of the liver. The fact that the rest of the liver shows no enlargement aids in diagnosis.

Leukocytosis is usually marked in abscesses of the liver of the pyæmic variety; it is likely to be absent in those due to the presence of the amœba coli.

Prognosis. Since early operation has become the preferred mode of treatment, this seems to be more favorable than previously. In any case, however, the condition is a very serious one and the probability of a fatal outcome is great.

Treatment. If the patient is seen early he should be kept in bed, upon a fluid diet and an ice bag should be applied over the liver; cupping is advised and the application of a number of leeches to the hepatic region and about the anus, in order to relieve the congestion of the portal system, may be employed. The bowels should be kept freely open by the administration of mild laxatives and ammonium chloride in twenty grain (1.30) doses three times daily may be given empirically. In the future we may be able to treat

the condition by means of the hypodermatic injection of a bactericidal polyvalent serum, examination of the patient's blood revealing the character the causative micro-organism and the type of serum indicated.

As soon as the presence of an abscess is determined surgical measures should be undertaken. These consist of various procedures such as aspiration, which is most likely to be successful in tropical abscesses; puncture with drainage, a large canula being employed and left *in situ*—later it may be replaced by a drainage tube of rubber. Aspiration is dangerous because the abscess may leak into the general abdominal cavity setting up a general peritonitis; severe hæmorrhage may occur if the aspirating needle wounds an artery; and finally it does not provide free and complete evacuation. The method of choice is free opening by incision. The interior of the cavity should be thoroughly investigated and neighboring abscesses, if present, also evacuated. After incision free drainage should be provided. Rupture into the peritonæum, pleura, lung, pelvis of the kidney or pericardium necessitates immediate surgical interference. In rupture into the intestine without peritonæal involvement, operation need not be undertaken unless the contents of the bowel enter the abscess cavity and produce a gangrenous process; here external opening and drainage are indicated. The treatment of subphrenic abscess is incision and drainage.

During convalescence the patient should seek a change of climate, either at the seashore or the mountains, where abundance of fresh air can be obtained; and tonics with abundant nourishing food should be prescribed.

Multiple pyæmic and pylephlebitic abscesses are fatal, usually without exception, and unless signs of localization become evident, radical measures are hardly advisable, the treatment being that of ordinary pyæmia.

PORTAL CIRRHOSIS OF THE LIVER.

Synonyms. Interstitial Hepatitis; Hob-nail Liver; Sclerosis of the Liver; Laënnec's Cirrhosis.

Definition. A chronic inflammation of the connective tissue framework of the liver resulting first in an hypertrophy of the organ and later, because of the tendency of the newly produced connective tissue to contract, in a diminution in its size and a consequent compression of its parenchymatous structure.

Ætiology. The causation of this disease has been in too great a degree attributed to the abuse of alcohol. While there is no doubt that alcoholic beverages exercise a certain amount of influence in its ætiology, for it has been variously known as the gin- or whiskey-drinker's liver, it is probably true that this influence is rather the result of their adulteration with deleterious substances and the fact that many wines are to-day artificially made from vinegar, logwood, etc., mixed with alcohol, than due to the alcohol

itself. It is also true that hepatic cirrhosis may be artificially produced in the lower animals in a short time, without the use of alcohol, by the administration of lactic, butyric, acetic and valerianic acids (Boix). Of these substances, all except the last may, in the human organism, result from digestive disorders, which are frequently caused by the ingestion of sophisticated wines, such as those mentioned above, or those "plastered" (6 parts of potassium sulphate to 1000.), or beers adulterated with picrotoxin, aloes, glucose, etc. It may also be caused by the prolonged ingestion of arsenic. Consequently the tendency to take a broader view of the disease should be encouraged and the cause should be sought in the alimentary canal.

It has been recognized for many years that cirrhosis of the liver occasionally is found in total abstainers from alcohol and that the prolonged indulgence in highly seasoned food and spices and condiments may produce a dyspeptic cirrhosis, also called the non-alcoholic cirrhosis of Budd.

Syphilis, particularly of the congenital type, is not an infrequent cause of cirrhosis, especially in children, and chronic malarial poisoning must be considered as a factor in the ætiology of this condition.

Trauma cannot be considered a true cause of hepatic cirrhosis but it may result in a localized perihepatitis beneath which a patch of interstitial cicatricial tissue may exist. This, however, never spreads through the organ.

The disease is usually seen in adults and in males more often than in females. It does, however, occur in children, in whom it may or may not be the result of congenital syphilis.

Pathology. The liver after death may be found to be either enlarged, of normal size, or contracted. Its surface may be smooth or nodular. On section it may be yellowish-red—especially in alcoholic patients—or yellow as a result of staining with bile pigments. Sclerosis of the liver is more properly termed cirrhosis than when the same changes take place in other organs.

The chronic productive inflammation results in an increase in the connective tissue stroma of the organ. This new tissue may surround groups of the liver acini or may be diffusely distributed among the liver cells, which are constricted by it or it may be the seat of a fatty degeneration, in which case the organ may be enlarged. The flow of blood through the organ is obstructed by the new growth of tissue and as a result of this the spleen becomes enlarged, there may be ascites and the lining of the stomach and intestines becomes congested. The increase of the stroma in the liver also may obliterate the small bile ducts and the large ones frequently are the seat of a catarrhal inflammation.

In many patients there is a general accompanying increase in the connective tissues throughout the body resulting in arteriosclerosis, fibromyocarditis, nephritis, etc.

Symptoms. The symptoms of hepatic cirrhosis may be classed as follows:

1. Those due to the co-existent inflammation of the gastric mucosa.
2. Those due to the interference with the secretion of bile.
3. Those due to the interference with the portal circulation.
4. Those due to the accompanying connective tissue inflammations in the heart, arteries, kidneys and lungs.

The gastric symptoms may antedate by several years those of the cirrhosis itself, and usually are those of a chronic gastritis, with nausea, and vomiting—which may often be the early morning “water brash” of alcoholic gastritis—eructations and constipation. The gastric symptoms are more pronounced in patients with an enlarged liver.

Jaundice of greater or less degree is a common symptom and occurs more frequently in the presence of an enlarged liver than in the atrophic form of the inflammation. With this symptom the urine contains bile and the fæces are more or less clay-colored. In certain patients a rapidly fatal form of jaundice occurs with emaciation, fever, and marked gastric and cerebral symptoms.

Hæmorrhages from the œsophagus, stomach, intestines and more rarely from the uterus, nose, kidneys and bladder, are symptoms referable to the obstruction of the portal circulation by the newgrowth of connective tissue. They may be large and at times alarming but only seldom result fatally, their usual effect being beneficent since they relieve the portal congestion.

Dilatation of the superficial veins of the epigastrium and lower part of the chest is due to the damming back of the blood from the portal into the systemic circulation. This, in extreme instances, may result in the formation of the *caput Medusæ*, the name given to the plexus of largely dilated veins about the umbilicus.

Ascites of greater or less degree is a common symptom of cirrhosis with a contracted liver. The abdominal fluid results from the portal obstruction and varies in quantity from a pint (500.) or two to an amount so large that the abdomen is distended to such an extent that there is protrusion of the umbilicus. Hydrothorax may occur and œdema of the legs may result from the pressure exerted by the ascitic fluid upon the veins returning the blood from the lower limbs. These symptoms are more frequently seen in the atrophic variety of the disease.

Splenic enlargement exists in a considerable number of patients, especially when the liver is small; often the presence of ascites makes examination of the spleen, as well as of the liver, so unsatisfactory that it is necessary to wait until paracentesis has been performed.

The enlarged liver may be tender and is usually smooth of surface, while the atrophic organ may be nodular.

The blood usually shows a considerable diminution in both red cells and hæmoglobin.

The urine of the hypertrophic liver is usually of normal specific gravity and is not likely to contain albumin. Bile pigment is frequently present. The urea content is not usually diminished.

In the urine of atrophic instances, bile pigment is seldom present, the specific gravity is low, albumin and casts may exist, the urea is usually diminished, and in the later stages of the disease blood may be found.

The symptoms of the concomitant connective tissue inflammations of the lungs, heart, arteries, etc., are those of these conditions when they occur separately.

Nervous symptoms are common in this disease, slight mental disturbance, loss of memory, failure of will power, and mental depression. Convulsions, coma and delirium usually precede death. Delirium tremens may occur after hæmatemesis, during a debauch or after an enforced abstinence from food.

Rise in temperature is not a feature of the disease but may occur when death is about to take place.

Physical Signs. These differ greatly in different patients and with the stage of the disease. On *inspection* the patient's skin and mucous membranes are usually seen to be pale; jaundice of the skin may be present or there may be merely the sub-icteroid hue and slight yellowness of the whites of the eyes. There may be œdema of the feet or general anasarca. When much intra-abdominal fluid is present the abdomen is likely to be prominent and tense; its superficial veins are dilated and at times the varicose condition of these structures known as the *caput Medusæ* is present. *Palpation* may reveal a large, small or normal sized liver with a rough or smooth surface. The spleen may or may not be palpable. *Percussion* may give us additional information as to the size of the liver and spleen and when ascites is present the note, while the patient lies upon his back, will be flat over the flanks, while that over the umbilical region, unless the abdominal cavity is entirely filled with fluid, will be tympanitic. Upon turning the patient's body to its side the flatness in the flanks will be found movable if the fluid does not wholly fill the abdomen. When the amount of ascitic fluid is small it may be detected by placing the patient in the knee-elbow position and percussing over the whole abdomen; there will be an area of flatness at its most dependent part surrounded by tympanitic resonance (Wilcox's sign).

The physical signs of the accompanying heart, arterial, kidney and pulmonary involvement will likewise be present, as well as those due to displacement of the abdominal viscera by the ascitic fluid.

Complications. A considerable proportion of deaths from this disease are due to pulmonary, and a small number to peritonæal tuberculosis. Rarely generalized tuberculosis may end the scene. Bronchitis is a very

/ blue mass

frequent accompaniment. Pleurisy with effusion which may be serous, sero-fibrinous or even hæmorrhagic is not uncommon. Renal diseases are frequent especially in the later stages.

Prognosis. Cirrhosis of the liver is a serious, though by no means always fatal condition. In certain instances the progress of the inflammation may cease and the patient may die of some other disease. Its course is usually chronic, lasting a year or two, although instances proving rapidly fatal have been reported. The hypertrophic form seems more rapid in its evolution than does the atrophic.

Treatment. The treatment of this condition may be separated into the following heads:

1. The diminution of the excessive connective tissue in the liver.
2. The treatment of the symptoms of the disease as they arise.
3. The prevention of further connective tissue change in the liver and consequent destruction of its parenchyma.

Toward accomplishing the first of these objects it is hardly probable that much can be done. The absorption of connective tissue growth, especially when syphilitic in origin, should always be attempted by the use of some form of iodine. Consequently this drug should be given tentatively whenever specific disease is even suspected. To achieve any effect its administration should be continued for a very considerable period. In all instances it is wise to give this agent a thorough trial. In the opinion of the author the preferable method of administering iodine is in the official syrup of hydriodic acid of the Pharmacopœia. It should be given in doses of one drachm (4.0) well diluted one-half hour before each meal, and is preferable to potassium iodide, being less likely to cause iodism. Whenever the urine shows the presence of diacetic acid, large doses of sodium bicarbonate should be administered and frequently repeated.

Treatment of Symptoms. *Ascites* may be treated by, (a) *Depletion by means of diuretics and purgatives:* Free diuresis may be produced and moderate ascites diminished by the administration of the Guy's diuretic pill — ~~calomet~~, powdered digitalis, powdered squill, of each one grain (0.065) — with the addition of one-fourth of a grain (0.016) of extract of hyoscyamus to prevent griping. One of these pills should be given three times a day for one week, then omitted for a week, repeated for a week and so on. Numerous other diuretic drugs may be employed in this connection. Of the potassium salts the acetate, bitartrate, or citrate may be employed; the preference is in favor of the first. It may be given in doses of twenty grains (1.30) three times daily. Theobromine has given varying results in the hands of different observers but the consensus of opinion is that it is inferior in ascites due to hepatic cirrhosis to many other diuretics. Small doses of calomel frequently repeated increase the excretion of urine. Citrated caffeine in doses of from two to five grains (0.12 to 0.30) may be employed. The fluid-

extract of *apocynum cannabinum* is a valuable and active diuretic in ascites, but should be given with care on account of its tendency to disturb the digestion. Its dose is from ten to twenty drops (0.65 to 1.30). The resin of *copaiba* increases the secretion of the kidneys but on account of its liability to cause gastric irritation should be given in capsules coated with keratin, ten to twenty grains (0.65 to 1.30) in each capsule. The fluidextract of *asparagus* in drachm (4.0) doses is a diuretic drug which may be tried.

Depletion by means of purgatives may be used as an adjunct to that by means of diuresis and numerous drugs of this class may be employed. Epsom salts, two ounces (60.0), dissolved in four ounces (120.0) of boiling water and allowed to cool, if given in the morning before breakfast, no liquid having been drunk since supper the night before, will produce five or six watery stools during the day. This mixture given twice a week will often ward off tapping for some time. Sodium phosphate is also an excellent purge and an hepatic stimulant as well; it may be given in doses of one-half to two drachms (2.0 to 8.0) at varying intervals according to the effect produced. Laxative mineral waters or their artificial salts may also be employed in this connection. Vegetable cathartics such as *cascara sagrada*, *rhubarb*, *aloes* and *jalap* may be used alternating with the salines. It is unwise to endeavor to remove ascites by marked purgation by means of the stronger hydrogogues for the attempt may be made at the sacrifice of the patient's strength.

Diminution of the ingested fluids in ascites is hardly to be advised since, while it may reduce the quantity of the transudate, this good is more than counter-balanced by the resulting diminution in the urine and tendency to constipation.

The treatment of dropsical conditions by the elimination from the diet of substances containing sodium chloride is receiving much attention and for it great claims are made. As a tentative measure it can do no harm in cirrhotic ascites and future research may throw more light upon the subject. For a consideration of the dechloridation treatment the reader is referred to the section upon chronic nephritis.

(b) *Abdominal paracentesis or tapping*. At the present time it is considered wise to tap the abdominal cavity as soon as the fluid is of sufficient quantity to annoy the patient; the old statement that a patient seldom survived two tapplings no longer holds, perhaps because of the present lessened danger of infection and the fact that the procedure is not now employed as a last resort. Accordingly, paracentesis should be performed as soon as the fluid causes any mechanical interference with the functions of the abdominal or thoracic viscera. Discomfort on the part of the patient is an indication for the operation as well as is a diminution of urine due to pressure upon the vessels of the kidneys by the fluid, interference with digestion or respiration due to the same cause, pulmonary congestion, as evidenced by the presence of râles at the bases of the lungs posteriorly, etc. In instances of ascites

with hæmatemesis due to venous congestion in the mucous membrane lining the stomach the procedure is also indicated.

Technique of Abdominal Paracentesis. The only apparatus needed is a trocar and canula of rather small calibre and of sufficient length to penetrate the abdominal wall of the patient in hand, and a few feet of rubber tubing to be attached to the canula, after the puncture, to lead the fluid to a vessel of sufficient size which is placed upon the floor.

The patient's bladder should be emptied, and the site of the intended puncture sterilized by scrubbing with soap and hot water, alcohol, ether and one to five thousand mercury bichloride solution. The usual site is in the mid-line of the anterior aspect of the abdomen about equidistant between the os pubis and the umbilicus; the situation chosen must be flat upon percussion. If no fluid is obtained at the situation above mentioned the puncture may be made at about the same level either to the right or left. The right iliac fossa should be carefully avoided because of the possibility of puncturing the cæcum in this vicinity.

The trocar and canula and the operator's hands having been properly sterilized and the site of the intended puncture anæsthetized by the application of the ethyl chloride spray or the subcutaneous injection of a few drops of a four percent. solution of cocaine hydrochloride, the puncture is made, the trocar removed and the rubber tubing attached. The patient may remain in a sitting or semi-reclining position during the procedure and, as the fluid is drained, an abdominal binder, which is tightened from time to time, to prevent sudden intestinal distention, is applied. Should the fluid stop flowing before the abdominal cavity is empty, the canula may be cleared by passing the trocar through it to dislodge any impediment. When sufficient fluid has been removed the canula should be withdrawn and the puncture dressed by the application of a bit of sterile gauze or cotton held in place by adhesive plaster or collodion. The patient should wear the abdominal bandage for several days following the operation. When a trocar of small calibre is used there is little danger but that the puncture will heal without leakage. The constipation which may follow tapping of the abdominal cavity and the possible tympanites may be relieved by saline laxatives.

(c) *The treatment of ascites by operation* with the view of establishing a collateral circulation between the systemic and portal veins, the so-called Talma's operation, has been much discussed but its results from a curative standpoint are not all that could be desired, which fact in the opinion of some observers, is due to the procedure being usually employed as a measure of last resort. It is possible that the results might be more favorable were the operation undertaken early in the disease. For the description of the operative technique of omental anastomosis and epiploxy the reader is referred to works upon abdominal surgery.

Hæmatemesis. The treatment of this distressing symptom of cirrhosis

of the liver differs little from that of the hæmatemesis of gastric ulcer (*see* p. 394.) The patient should receive no food by the mouth for three or four days following the hæmorrhage and during this period food may be administered *per rectum*. The first food allowed should be in fluid form and may consist of milk, gruels, and broths, if possible partly predigested by peptonization. Gradually the patient should be brought back to solid diet (*see* p. 386), and after about ten days he may be allowed to leave his bed. The after treatment consists in a regulation of the diet, only easily digested and non-irritating foods being allowed, and the administration of tonics. The patient should be advised to conduct his habits and mode of life in accordance with hygienic principles.

Hæmorrhage evidenced by the appearance of blood in the stools. Blood so changed by the fluids of digestion that it presents a tarry appearance may be voided with the fæces even when there has been no vomiting of blood. After such hæmorrhage the patient must remain quiet for a number of days and his feeding should be carefully conducted. Otherwise the treatment consists in meeting the indications as they arise.

The management of rectal hæmorrhage due to the presence of hæmorrhoids consists in treatment of this complication in accordance with ordinary methods (*see* p. 462).

The treatment of concomitant digestive disturbances. Alcoholic drinks are contra-indicated and the diet should be so regulated as to prevent the formation in the digestive tract of such products of fermentation as lactic, acetic and butyric acids. The accompanying chronic gastritis with the excessive production of mucus which is of frequent occurrence may be relieved by the drinking of a glass of hot water before each meal, which tends to dissolve the mucus from the wall of the stomach, or by gastric lavage. Fermentation may also be relieved by the administration of drugs of the class of internal antiseptics such as phenyl salicylate, resorcinol, sodium phenol-sulphonate and the bismuth salts, particularly the naphtholate. Small repeated doses of calomel are useful in this connection, one-tenth of a grain (0.006). The use of this drug will also tend to prevent constipation. The bowels should not be allowed to become constipated for this condition favors the production of the toxic substances above mentioned. Constipation may be prevented by the moderate use of salines such as sodium phosphate or sulphate, the laxative mineral waters, etc. The drinking of plenty of ordinary water is to be recommended.

Atonic conditions of the stomach call for the administration of small doses of strychnine, one-sixtieth of a grain (0.001). The use of pepsin and other artificial digestants, in the opinion of the most advanced observers is unnecessary. The administration of drugs prepared with alcohol is to be avoided in so far as possible.

The prevention of further connective tissue growth in the liver is to be brought

about by attention to the gastric condition, the treatment of which has been dealt with above, and by regulation of the diet and mode of life. Alcohol should be forbidden and the patient should become a total abstainer. Tobacco should be used in moderation only, if at all. The interdiction of alcohol, of course, does not apply to those late stages of the disease where its use as a stimulant is necessary. Some patients, no matter what is said by the physician, will insist upon taking a certain amount of alcohol; such should be directed to take it largely diluted and in a full stomach.

Diet Certain observers consider an exclusive milk diet the ideal in cirrhosis of the liver, which it no doubt is, but it will be found difficult in private practice for obvious reasons to enforce so restricted a régime. Certain patients either cannot, or think that they cannot, take milk, others refuse to undertake such a rigid diet. Where milk is not well borne it may be taken in the form of skim milk—which reduces its fat content—diluted with carbonic, Vichy or other mineral water. Kumyss or matzoon may be agreeable temporary substitutes for milk, but the former possesses the disadvantage that it contains alcohol. The quantity of milk necessary is from two to three quarts (litres) every twenty-four hours, and it is best borne when taken in small quantities at a time. At times it may be advantageous, especially when digestion is impaired, to partially predigest the milk by peptonization. Various semi-solids such as gruels, junket, etc., which have milk as their basis, often furnish a pleasing variation to the routine. At the beginning of treatment a milk diet should usually be prescribed, to be followed, as the patient improves, by a gradual return to solids. The easily digested cereals, soft-boiled eggs, vegetable purée soups, may be given first, to be followed by a more liberal diet. All highly seasoned or spiced foods are to be forbidden, but the patient may be allowed fish or meat at one meal during the day and a moderate amount of carbohydrate food in the form of green vegetables and stewed fruit. A moderate amount of white bread either toasted or not may be permitted. Fats must be restricted since when digestion is impaired they are very prone to give rise to the fermentation products which are such a considerable factor in the causation of hepatic cirrhosis. Too much starchy food must not be given on account of the likelihood of consequent gastric and intestinal fermentation.

With regard to beverages, cocoa made with milk, tea and coffee, with the addition of plenty of milk, may be allowed.

The patient's mode of life should be modeled on hygienic lines of which regularity is the key-note. Regular hours for eating, exercise and sleep should be insisted upon. With regard to exercise a moderate amount of bicycling, walking or golf may be suggested.

Water cures at various springs and baths may often be taken in the early stages of the disease with good results. In the United States, Saratoga may be recommended and the continental spas of Carlsbad, Vichy, Marienbad,

Kissingen, Franzensbad, and Homburg may be mentioned in this connection. It is quite as likely that the regular mode of life prescribed at places of this sort will do as much for the patient as will the bathing in or drinking of the waters.

Massage and passive muscular exercise in patients too weak to take active exercise are useful adjuncts to treatment, and abdominal massage is important in relieving the common symptom of constipation.

Drugs, other than those hitherto mentioned, have been employed in considerable number with the object of combating the disease. Claims have been made for ammonium chloride, which is sometimes useful in the early stages of the disease, iodoform and nitrohydrochloric acid. The administration of iodoform has been undertaken on account of its content of iodine but potassium iodide is quite as effective and better tolerated. Nitrohydrochloric acid may be given in as large doses as the patient will tolerate.

Organotherapy by the administration of macerated pig's liver and by hypodermatic injection of liver extract has been attempted and good results have been reported by a number of French observers. Apparently this form of treatment does no harm other than causing looseness of the bowels, and future experimentation may throw more light upon this interesting subject.

Pigmentary Cirrhosis of Hæmochromatosis.

Synonyms. Diabète Bronzé; Bronzed Diabetes.

Definition. This was first described by Troisier in 1871 and is a pigmentation of the liver cells resulting in their degeneration, later their necrosis with liberation of the pigment which now infiltrates the fibrous tissues; the whole process is associated with diabetes.

Ætiology. It is likely that some toxic material causes hæmolysis and acts upon the cells of the liver so that the blood-pigment is transformed into insoluble hæmosiderin. It is possible also that both of these processes may be due to bacterial activity. This pigmentation is also found in the pancreas, lymphatic glands, secreting glands, intestines, heart-muscle and skin. It is likely that diabetes supervenes when the islands of Langerhans are involved so that this may be regarded as a late manifestation of the hæmochromatosis.

Symptoms. These may be both referable to the cirrhosis and to the diabetes.

Diagnosis. The skin may resemble that of Addison's disease or possibly of severe argyria, from both of which the history will readily differentiate.

Prognosis. This is very unfavorable.

Treatment. This is more especially to be directed to the diabetes (*see p. 277*). To prevent the development of this complication the patient should live on a bland diet and receive treatment to prevent intestinal fermentation and putrefaction.

cf *Hæmochromatosis*
by George Shumer

Yale Med Jour
1911

New section of
Diakite azobenzene
Synonym. Azobenzene



BILIARY CIRRHOSIS.

This will be considered under (a) Hypertrophic biliary cirrhosis and (b) obstructive biliary jaundice.

Hypertrophic Biliary Cirrhosis.

Synonyms. Hanot's Cirrhosis; Hypertrophic Cirrhosis with Jaundice.

Definition. A disease marked by enlargement of the liver and spleen, presenting the symptoms of chronic jaundice, periodic febrile attacks, without ascites.

Ætiology. This generally occurs in young subjects, males slightly preponderating; alcoholic excesses may predispose to the disease by weakening the powers of resistance. The fever, splenic enlargement, glandular enlargement, not only at the porta but often in other parts of the body point to a catarrhal inflammation of the small bile-ducts probably due to an infection. Possibly the disease may be due to a local infection of the bile-ducts from the duodenum,—an ascending cholangitis.

Pathology. The liver is uniformly enlarged, the surface is generally smooth in the early stages, later it may become irregular. The organ shows fibrosis but the liver cells are usually well preserved until late in the course of the disease. The spleen is relatively more enlarged than the liver.

Symptoms. After a gradual loss of strength, existence of dyspeptic symptoms and slight abdominal pain, jaundice sets in. Later attacks of fever, increased abdominal pain and jaundice occur from time to time, each one leaving the patient in a worse condition. Nausea and vomiting are rare; so is hæmatemesis. Diarrhœa occurs upon slight provocation. There is a sense of weight in the right hypochondrium, the liver is enlarged, smooth and firm to the touch. The gall-bladder can rarely be palpated. In some very chronic instances there is clubbing of the fingers, especially in very young subjects. There is usually anæmia. The urine is generally increased in quantity, always contains bile pigment and sometimes urobilin and indican.

Diagnosis. From obstructive jaundice the presence of bile in the fæces is characteristic. If due to calculi the age of the patient and the severity of the pain obviate mistake. If a reliable history is obtainable it can be distinguished from Banti's disease.

Prognosis. The disease is incurable but its progress may be slow and a fair degree of strength maintained for years.

Treatment. A more generous diet is allowed in this disease than in atrophic cirrhosis. It should be simple and nourishing, milk in large quantity, eggs, bread and butter, plain puddings, meat, all are safe. Only small quantities of alcohol and then well diluted are allowed. Water should be freely drunk and preferably boiled. Fresh air is important but chilling must be avoided, as well as cold and damp weather. The clothing should be

warm. Homburg, Ems and Neuenahr or a very mild course at Carlsbad may be advised. Intestinal fermentation must be prevented by small doses of calomel thrice daily. Saline purgatives and such waters as Villacabras or Rubinat are necessary. Phenyl salicylate (salol) is useful to prevent putrefaction. Itching of the skin will be lessened by full tub-baths of hot water to which a pound (500.) of sodium bicarbonate and two pounds (1000.) of sodium borate have been added. Calcium chloride in twenty grain (1.30) doses, well diluted, thrice daily is often effective.

Obstructive Biliary Jaundice.

Definition. A fibrosis extending from the bile-ducts around the lobules of the liver and due to obstruction of the large ducts.

Ætiology. The cause is undoubtedly bacterial infection. As a result of biliary stasis, icteric necrosis of the liver cells takes place and a diffuse fibrosis results.

Pathology. The liver is primarily enlarged but later becomes small unless occupied by secondary growths. There is atrophy and condensation of tissue about the dilated bile ducts.

Symptoms. The features of this disease are similar to those of obstruction such as occurs in acute catarrhal jaundice (*see* p. 499). The functional activity of the liver is markedly interfered with and cholæmia results. The gall-bladder is usually dilated. Sometimes ascites and dilated abdominal veins may be observed. The spleen is usually of normal size. There may be a perilobular pancreatitis but as a rule no diabetes.

Diagnosis. If gall-stone obstruction exists the symptoms of portal cirrhosis are usually absent. Biliary obstruction does not give rise to any fixed type of cirrhosis, either pathological or clinical.

Prognosis. This is a much more rapidly fatal disease than hypertrophic cirrhosis.

Treatment. Constipation should be prevented by exercises, plenty of water and salines. Occasionally a blue pill (mass of mercury,) four grains (0.25), should be taken. Fresh ox gall in keratin-coated pills should be taken in considerable quantity to replace the absent bile, before meals, thrice daily. Pruritus is relieved by the same methods as above advised. Milk is advisable in the early stages, later boiled rice, chicken, fish with a small quantity of meat is allowed.

THE FATTY LIVER.

Definition. Fatty degeneration is a morbid production of fat at the expense of the protoplasm of the liver cells. Fatty infiltration is an exaggerated physiological storage of fat in the hepatic cells.

Ætiology. Fatty infiltration is to some extent present in the normal

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liver, tiny droplets of oil being always contained in the hepatic cells. There are three types: (a) In such conditions as obesity and chronic alcoholism the liver cells contain more than their normal amount of fat, the excessive quantity ingested or produced by metabolism being stored in this situation. (b) In cachectic states, such as chronic tuberculosis, extreme anæmia, etc., there is an interference with oxidation and the ingested fat accumulates in the liver. (c) In phosphorus poisoning there is a change produced which is analogous to that which takes place in acute yellow atrophy. The substance of the cell is converted into fat—and perhaps other substances—and necrosis follows. This is a more serious condition than the fatty infiltration observed in obesity and cachectic states.

Pathology. The fatty liver is uniformly one of the largest met as a result of pathological change. Its consistency is soft and its surface smooth; its color is light and in the later stages yellowish. Its outer surface is dry and greasy. The increase in fat results in such a decrease in the specific gravity of the organ that it floats in water.

Symptoms. These are those of the condition which causes the hepatic condition and are not characteristic. Jaundice in uncomplicated cases is absent and although the fæces may be light in color there is little interference with the formation of bile. There is no ascites and the spleen is not increased in size. In obese patients the hepatic enlargement may be impossible of demonstration but in emaciated subjects the enlarged organ is easily palpated. Its consistency is inclined to be soft and its surface smooth.

Diagnosis. Of the fatty liver this is usually not difficult. It may be differentiated from the amyloid liver by its firmer consistency, the absence of splenic enlargement and albuminuria. Leukæmic livers are firmer and the blood confirms the diagnosis. If hydatid cyst be present the liver is more prominent and easily felt; there may be pressure symptoms, pain or even fever (*see also the diagnosis of cancer of the liver, p. 490*).

Prognosis. This is that of the associated disease. Patients with fatty liver bear surgical operations poorly and often fall an easy prey to intercurrent disease, especially pneumonia.

Treatment. The treatment of the affection is that of the primary cause, such as tuberculosis or obesity. In the former condition a limitation of the ingested fats, codliver oil, etc., has been suggested. In the instances of fatty degeneration resembling acute yellow atrophy the treatment is that of this disease (*see p. 488*).

THE AMYLOID LIVER.

Synonyms. Waxy, Lardaceous or Albuminoid Liver.

Definition. An affection of the liver characterized by various degrees of infiltration of the substance of the organ by amyloid material.

Ætiology. Amyloid liver occurs as a part of the generalized waxy

degeneration of the viscera which is associated with cachectic states, particularly those characterized by prolonged suppuration. It is especially common in tuberculous bone disease but is less frequent with pulmonary tuberculosis. Of other causes tertiary syphilis is important and the condition is also observed in cancerous cachexia, rickets and protracted convalescence from the acute infectious diseases.

Pathology. The liver is greatly increased in size, it is smooth of surface and firm in consistency and its cut section has an anæmic, waxy appearance. Treated with tincture of iodine it turns a mahogany brown color. The degenerative process may be localized in one part of the organ and it may be associated with fatty infiltration. In instances due to syphilis the surface may be studded with nodules (gummata). The amyloid change involves the walls of the small blood-vessels, but not the liver cells. The first vessels to be attacked are those of the median portion of the lobule, later the capillaries between the lobules and their supporting connective tissue are affected.

Symptoms. These are not definite and consist chiefly of the manifestations of the primary disease. There is no jaundice unless some other factor, as gumma, is present but the fæces may be of lighter color than normal; the secretion of bile is not stopped. Ascites is absent but the spleen may be enlarged; this organ, with the kidneys, is usually the seat of associated amyloid degeneration. Albuminuria may be present.

Physical examination reveals a greatly enlarged liver of increased hardness and smooth surface, except in syphilis, when nodules may be present. The edge of the organ is often sharp and firm. There is no tenderness.

Diagnosis. An enlarged, smooth, and painless liver in a tuberculous, syphilitic or otherwise cachectic patient is almost invariably the seat of waxy degeneration. For further points in differentiation the reader is referred to the paragraph upon the diagnosis of cancer of the liver (*see* p. 490).

Prognosis. If the liver is so large that it can be readily felt the outlook is bad. At this stage the kidneys and intestines are likely to be the seat of the same manifestations. If the disease has not made much progress and the primary disease yields to treatment the liver may decrease in size.

Treatment. This consists in removal of any responsible focus of suppuration by surgical means; the appropriate treatment of pulmonary tuberculosis by means of diet, tonics and change of climate, and of syphilis by potassium iodide is necessary should either of these diseases be the causative factor. The mode of life should be regulated in accordance with hygienic principles; plenty of fresh air, moderate exercise, if the patient's physical condition is fit, and simple nourishing food in proper quantity should be prescribed.

Iron, arsenic and the bitter tonics may be administered and any digestive disorders should be corrected by the usual means.

SYPHILIS OF THE LIVER.

Varieties. Syphilis of the liver may be hereditary or acquired.

1. *Hereditary syphilis of the liver* occurs in an early or congenital type and as delayed hereditary syphilis (*syphilis hereditaria tarda*). The congenital form is characterized by a diffuse or localized cellular infiltration. The former results in slight, if any, change in the gross appearance of the organ other than moderate enlargement and an increase in density; later the size of the organ may be diminished and its shape distorted due to the connective tissue proliferation and its subsequent contraction.

In tardy congenital syphilis the liver is also enlarged and may be the seat of gummatous nodules. Its subjects are poorly developed and there may be clubbing of the fingers.

2. *Acquired syphilis of the liver* may involve the organ during the secondary stage but tertiary lesions are much more common. With the eruption there may be jaundice and slight enlargement of the gland, acute yellow atrophy may ensue but this is extremely infrequent, secondary syphilis of the liver being usually a mild affection.

Tertiary hepatic syphilis is not very uncommon. It may occur as a diffuse increase in the connective tissue of the organ analogous to that of ordinary cirrhosis. The new connective tissue is often unevenly distributed; most commonly, however, tertiary syphilitic disease of the liver is characterized by the incidence of gummy tumors. These are nodular growths of size varying from that of a small pea to that of a base ball; they are situated in various parts of the organ, favorite sites being the upper surface near the suspensory ligament and upon the inferior surface in the connective tissues at the porta; gummata also are found in the parenchyma of the liver. The larger tumors tend to undergo cheesy degeneration and sometimes subsequent calcification. Following the degeneration the nodules contract and tend to distort the shape and reduce the size of the organ. On section of the liver, bands of connective tissue and the cicatrices which have resulted from the contraction of the shrunken gummata may be observed.

Symptoms. These may not suggest the nature of disease in any manner whatever unless there are manifestations of syphilitic disease elsewhere in the body. Usually the first symptoms are those of obstruction to the portal circulation; ascites may be present, and there may be slight jaundice. The patient is often anæmic and his appearance and symptoms suggest malignant disease.

Physical examination may reveal the presence of a much enlarged liver with bulging of the lower ribs on the right side and prominence of the epigastrium. The organ is hard and firm; nodules may be palpable upon its surface. The spleen may be increased in size.

Diagnosis. In the presence of a specific history and associated lesions

this is simple. The use of the Wassermann reaction and the test of treatment will render the diagnosis clear.

Prognosis. In congenital syphilis this is fairly good, under proper treatment, although in many instances the child may die within a few days of birth. In tertiary syphilis of adult life, in otherwise healthy patients, the prognosis under energetic treatment is also favorable but marked hepatic and splenic enlargement and jaundice are considered symptoms of bad omen.

Treatment. In the congenital form of the affection the usual treatment of hereditary syphilis in infants is indicated. Mercury may be given either by inunction or by the mouth, the former being preferable, each inunction consisting of about fifteen grains (1.0) of the official ointment, a fresh site being chosen for the successive frictions as suggested under the treatment of constitutional syphilis. If it is preferred to give the drug by mouth mercury with chalk is as good a preparation as any, the dose for a child of two months or less being one-half of a grain (0.03) twice daily; an older child may receive one grain (0.065). The treatment by means of mercury should be continued daily for several months, when intermissions of increasing length are to be advised. During the second year potassium iodide, in small doses, should be added and during the third year should be increased in amount. In the fourth year the mercury may be stopped, but it is advisable to continue the administration of the iodide.

Tertiary syphilis of the liver in adults should be treated according to the usual methods employed in the third stage of the disease (*see* treatment of syphilis, p. 158).

ACUTE YELLOW ATROPHY OF THE LIVER.

Synonyms. Acute Parenchymatous Hepatitis; Icterus Gravis; Malignant Jaundice.

Definition. An acute destructive affection of the liver characterized by necrosis and atrophy of the organ and associated with marked constitutional symptoms.

Ætiology. The disease is more common in women probably because of its frequent association with pregnancy; it is most usually seen in early adult life, but has been observed in young children. It has occurred during the course of the acute infectious diseases, hepatic cirrhosis, and syphilis; alcoholism and mental emotion have been considered as factors in its production. Micro-organisms, more especially the colon bacillus, have been found in the liver *post mortem* but are believed to have no connection with the causation of the disease.

Pathology. After death the liver is found to be much smaller than normal, reduction to even one-fourth of its usual weight having been observed. The capsule is loose and wrinkled, the organ is greenish-yellow in color, is

flattened and flabby, and there is no distinct demarcation between the lobes. The condition is similar to that which occurs in phosphorus poisoning as a result of a toxæmic catarrhal process in the smaller bile ducts. The cut section of the organ is yellow or yellow and red, the former color evidencing an earlier state of the affection. Under the microscope the liver cells are found to be in various stages of disintegration, only a few having retained their normal condition. Areas of complete necrosis are seen in which the hepatic cells have been replaced by degenerated matter consisting of fatty granular débris, bits of connective tissue, bile pigment, and crystals of leucin and tyrosin. There is a catarrhal inflammation of the smaller bile passages and there may be hemorrhages between the hepatic cells. The gall-ducts and bladder are empty. In certain instances in which the course of the disease is not acute, attempts at repair may take place either by hyperplasia of the remaining normal liver cells or reproduction of cells resembling those of the liver from those of the bile passages between the lobules.

The skin and the organs are usually bile-stained, there is splenic enlargement, granular degeneration of the renal epithelium, and fatty infiltration of the cardiac muscle. There are hæmorrhages into the various tissues and the fluid in the serous sacs may be increased.

Symptoms. The first of these are those of a gastro-duodenitis with increasing jaundice. These persist from a few days to several weeks; there are headache, anorexia, nausea, vomiting and epigastric distress; these are followed, sometimes suddenly, by constant vomiting and at times by hæmatemesis, delirium, tremors, convulsions, and perhaps coma. The jaundice increases, there are hæmorrhages into the skin and mucous membranes, and in women abortion may take place. Fever is not characteristic and may be absent; a moderate *ante mortem* temperature seldom rising above 101° F. (38.2° C.) is not uncommon. The pulse becomes gradually weak and rapid and the so-called typhoid state becomes evident.

The diminution in the size of the liver is rapid and the shrunken organ may be impossible of demonstration by percussion owing to the tympanitic note over the hepatic region resulting from the intervention, between the liver and the abdominal parietes, of distended intestine. The spleen is enlarged.

The urine is of high specific gravity, colored with bile pigment and may contain casts as a result of the concomitant degeneration of the kidneys. The urea is markedly diminished, even absent at times, but the ammonia is increased. Leucin and tyrosin crystals are usually present and may be demonstrated by allowing a few drops of urine to evaporate upon a slide and examining the result with the microscope.

The fæces are usually light colored.

Diagnosis. In the early stages it is impossible to separate acute yellow atrophy from acute catarrhal jaundice and it must be remembered that cerebral symptoms may occur in this latter affection; usually the concurrence

of icterus with decrease in the size of the liver, the presence of leucin and tyrosin in the urine and the symptoms of a severe intoxication render the diagnosis in the later stages simple. The small liver will differentiate the condition from hypertrophic cirrhosis, and acute phosphorus poisoning, which closely resembles acute yellow atrophy in many respects, may be separated by the absence of leucin, less amount of tyrosin, the less rapid shrinkage of the liver, the more severe gastric disturbance, the history, and the milder cerebral symptoms.

Prognosis. This is extremely unfavorable, but a few instances of recovery have been observed. The usual duration of the disease is several weeks.

Treatment. The patient should be kept at rest in bed, the diet should consist wholly of milk and possibly other easily digestible fluids, and measures should be taken to disinfect the intestinal tract and favor the elimination of toxic products from the blood. The former consideration may be carried out most effectually by the administration of bismuth naphtholate or bismuth tetraiodophenolphthaleinate (eudoxin) either alone or combined with phenyl salicylate in proportion of five grains (0.30) of one of the bismuth salts to three to five grains (0.20 to 0.30) of the latter substance. A dose should be given four times a day. The bowels should be kept freely open by means of purges, especially calomel, which is best given in fractional doses. Elimination through the kidneys should be promoted by diuretic drugs such as citrated caffeine, by frequent draughts of water, and by large high enemata of hot normal saline solution; the latter is a most effective means of promoting diuresis and may be employed as often as two or three times daily, eight quarts (litres) or more of the solution being given at each occasion. The hot saline is also taken up by the blood and serves to dilute the toxins circulating in this fluid; this latter consideration may also be favored by hypodermatoclysis or intravenous infusion of normal saline solution.

The vomiting may be controlled by rest; judicious feeding (diluted or peptonized milk), pellets of ice, small doses of dilute hydrocyanic acid or of cocaine hydrochloride, menthol one-thirtieth of a grain (0.002), or a teaspoonful (4.0) of hot water frequently repeated.

For the nervous symptoms the bromides and warm baths are often effective; hydrated chloral and morphine should be employed only when absolutely necessary. In the incidence of heart weakness or collapse, free stimulation is indicated.

NEOPLASMS OF THE LIVER.

Carcinoma is by far the more common type of the malignant tumors of the liver, and of internal cancer that of the liver is only less frequent than that of the uterus and stomach. The affection is rarely primary, being

in most instances secondary to similar disease of other structures. Most often it is secondary to carcinoma elsewhere in the portal area, particularly of the stomach. It is most common in men in advanced adult life but it has been observed in children. A hereditary predisposition is considered to be of some influence in its incidence.

Pathology. *Primary hepatic carcinoma* occurs in three types:

1. *Massive carcinoma* which is characterized by marked increase in the size of the organ and in which the new growth is distributed uniformly through a considerable portion of the liver. On cut section the growth is firm and of grayish-white color, and the line of demarcation between it and the adjacent hepatic tissue is sharp.

2. *Nodular carcinoma* presenting nodular growths of varying size, distributed through the organ. One of the nodules is often firmer and larger than the others and is the primary growth from which the others have sprung.

3. *Adeno-carcinoma with interstitial hepatitis* is a very rare form of carcinoma of the liver in which the organ is usually small, its surface is greenish and mottled and studded with nodules. Cut section reveals firm growths in great numbers between which are bands of connective tissue. The liver parenchyma may be the seat of hypertrophy.

Secondary carcinoma of the liver is characterized by extreme enlargement, its surface is studded with nodules which are also distributed evenly through the substance of the organ; rarely one lobe only may be affected. The nodules vary in size and consistence, are whitish or yellowish in color, and those just beneath the capsule may be felt through the abdominal parietes and are at times umbilicated (Farre's tubercles). Vascular rupture with hæmorrhage beneath the capsule into the gall-bladder or peritonæal cavity may take place.

Histologically hepatic carcinomata are epitheliomata of the alveolar or trabecular type. The cells are of different types, polyhedral, giant, or more rarely cylindrical; at times different varieties of cells are seen in the same growth. Degeneration may take place in both the primary and secondary tumors but the latter are more particularly susceptible. The changes which may take place are of different varieties, fatty and hyaline degeneration, and sclerosis and hæmorrhage, at times is succeeded by suppuration.

Sarcoma of the liver is very rarely primary; secondary hepatic sarcoma is not especially uncommon, instances of lympho-sarcoma, myxo-sarcoma, and glio-sarcoma have been observed. Melano-sarcoma is the most frequent type and usually secondary to similar growths in the orbit, or it may occur in association with generalized melano-sarcoma. The occurrence of melanotic tumors in the skin may suggest the possibility of similar growth in the liver.

Symptoms. These consist of progressive emaciation, weakness, and prostration, with hepatic enlargement. Digestive disorders are common,

such as anorexia, nausea, vomiting and pain or a feeling of weight in the epigastrium or in the region of the liver. The pain varies; it may be wholly wanting or it may be of severe character and is sometimes referred to the right shoulder. Jaundice of moderate degree may be present; it is said to exist in about fifty percent. of patients. The urine is colored with bile pigment, if there is jaundice, but the stools are seldom clay-colored. Ascites occurs both in the rare forms of cancer with cirrhosis and as a result of pressure upon the portal vein or of peritonæal metastases. If tapping reveals the presence of blood-tinged fluid in association with a growth of the liver the probability of malignant tumor is great.

The blood is that of a secondary anæmia and consequent œdema is frequent. A febrile movement is not uncommon especially in the late stages; it is often continuous— 100° to 102° F. (37.8° to 38.9° C.)—but may be intermittent. Chills may be noted.

Physical Examination. Upon inspection the patient is seen to be emaciated and cachectic in appearance. The skin may be of icteric color and there is usually a prominence of the upper abdomen with a dilatation of the superficial veins. Palpation reveals the edge of the liver from an inch or two below the margin of the ribs to the level of the umbilicus or even lower. The surface of the organ may be smooth but in nodular cancer the prominences and sometimes the depressions in their centers may be felt. Tenderness may be present. The increase in size is also evident upon percussion and it usually involves the whole organ but may affect one lobe more than the other. Splenic enlargement is not characteristic nor frequent.

Primary neoplasms may be difficult of differentiation from those of secondary type unless there is a demonstrable primary growth elsewhere in the body.

Diagnosis. This may be difficult in the absence of primary carcinoma of other structures. The presence of firm nodules on the surface of the organ simplifies the diagnosis but the smooth cancerous liver is a more complicated problem. It may be differentiated from the fatty liver by its hardness, the absence of cachexia, and jaundice. These last two are also absent in the amyloid liver and here the spleen is usually enlarged. In abscess we have the history of amœbic dysentery or other forms of colitis and the presence of a septic temperature to aid us; the organ is usually soft and fluctuation may be elicited. The nodules which occur in hydatid disease with an enlarged liver are often fluctuating, the cachexia is not present, and the course of the disease is more protracted than that of cancer. Aspiration of one of the cysts may show the presence of hooklets.

Another difficult problem is the separation of the amyloid liver with the surface of the liver studded with gummata. Here the presence of a history of syphilis and the benign course of the affection are diagnostic points. In hypertrophic cirrhosis we have an enlarged liver with jaundice but the onset

of cachexia is deferred, wasting is not extreme, pain is absent, the liver is smooth, and the ascitic fluid does not contain blood nor cancer cells; the spleen is usually enlarged. That form of carcinoma which is associated with cirrhosis is extremely difficult of differentiation from atrophic cirrhosis; the emaciation is, however, more rapid in the former affection.

Melano-sarcoma usually follows pigmented growths in other parts, particularly the choroid of the eye and the skin; there is great enlargement in the liver and often metastatic growths in the kidneys, lungs, and other organs are present.

The importance, in instances of hepatic affection in which a malignant nature is suspected, of thoroughly searching for the presence of primary cancer elsewhere, cannot be over-rated. The stomach, uterus and rectum, in particular, should be investigated by all the means at our command.

Prognosis. This is, of course, distinctly unfavorable, the condition usually resulting in death in a few months; exceptionally life may be prolonged for a year or slightly longer.

Treatment. Medical treatment can be but palliative. For the pain the hypodermatic administration of morphine may be prescribed without compunction for the character of the disease is such as to render the induction of the habit harmless. The addition of small quantities of atropine to the former drug will lessen the tendency to constipation. This symptom, when present, is preferably treated by means of the vegetable purges such as cascara, senna, aloes, etc.; the saline waters, according to German observers, should not be employed.

Hepatic pain may be relieved by the application of hot or cold compresses, poultices, anodyne plasters or counterirritants such as tincture of iodine, or liniments.

The appetite may be improved by the vegetable bitters and dilute hydrochloric acid—ten drops (0.65) in a glass of water with each meal.

Vomiting may be controlled by the administration of bits of cracked ice, sodium bicarbonate and cerium oxalate in milk, small doses of dilute hydrocyanic acid or of creosote. Gastric lavage is most effective. Intestinal fermentation is benefited by the bismuth salts especially the naphtholate or iodophenolphthaleinate in doses of five grains (0.30) three times daily.

The pruritus which sometimes accompanies the jaundice may be relieved by warm baths containing sodium carbonate, lotions of two percent. solution of phenol, and the other means suggested under the treatment of catarrhal jaundice. Calcium chloride, fifteen grains (1.0) three times daily and hypodermatic injections of pilocarpine, one-sixth of a grain (0.01), are said to be effective.

The diet should be nourishing and easily digestible. Frequent small meals are preferable to larger ones at longer intervals. Milk, when well borne, is very valuable, but if large amounts are taken at once heavy curds

may form in the stomach. To obviate this Vichy from a siphon, or lime water may be added. Kumyss and matzoon are excellent substitutes when the patient cannot take plain milk or has become tired of it. Meat and fats are often not well tolerated, but the various meat extracts may be employed if desired. Cereals and gruels are excellent. Usually the patient may be allowed to select the foods which he likes if they are not disturbing to the digestion.

Surgical treatment may be effective when the growth is single, primary, and in a favorable situation. Recovery has followed in at least one instance of secondary tumor, the primary growth in the stomach having been excised and at the same time a secondary nodule in the liver was extirpated. The advances which are daily being made in surgical technique lead us to hope that it may soon be possible to undertake operations upon the liver which were previously considered impracticable.

If marked ascites is present repeated tapping may be necessary.

PARASITES OF THE LIVER.

Echinococcus Disease of the Liver.

Synonym. Hydatid Disease of the Liver.

Definition. A disease of the liver due to invasion of the larva of the *tenia echinococcus* (the dog tapeworm) and characterized by the formation of cysts within the substance of the organ.

Ætiology. The *tenia echinococcus* is a minute cestode of three or four segments and about one-fifth of an inch (4 to 5 mm.) in length; the head is small and possesses four sucking disks and a rostellum with two rows of hooklets. The natural habitat of this parasite is the upper intestine of the dog, wolf, fox, and jackal. The worm is rarely met in the United States possibly because it is so small as to be easily overlooked. Echinococcus disease is most common in those countries where the relation between dogs and men is intimate, as in Iceland and Australia.

Pathogenesis. The terminal segment of the parasite, containing several thousand eggs, is cast off by the dog in his intestinal evacuations and, entering the human alimentary tract with food or drink, the egg shell is dissolved and the larva is liberated. It bores its way into some branch of the portal circulation and is carried by the blood stream to the liver. Here it lodges and the hooklets, by means of which it entered the blood-vessel, disappear. The embryo now becomes a small cyst consisting of two layers, the external or ectocyst which is laminated and cuticular in structure and the internal or endocyst, a parenchymatous or germinal layer. The fluid of the cyst is clear and the whole vesicle is enclosed by a capsule of connective tissue which develops as a result of inflammatory reaction. When the primary cyst has

increased to a diameter of three- to four-fifths of an inch (15 to 20 mm.) buds develop from the germinal layer which gradually become cysts themselves with a structure identical with that of the primary vesicle. These daughter cysts are at first attached to the lining of the mother cyst but later free themselves and become in turn the parents of a third generation of vesicles.

From the granular inner layer of parent and daughter cysts brood-capsules develop by a budding process, and from their lining membrane projections are formed which ultimately become scolices which really are the heads of *tenia echinococci* with their suckers and hooklets. These when freed and ingested by the dog may develop into the adult parasite.

The preceding is the usual form of the development of the echinococcus in man; at other times the daughter and granddaughter cysts remain within the parent and in animals the buds may force their way between the two layers of the cyst wall and grow outward—the exogenous type. In still another type—the multilocular—the buds which are formed from the parent cyst become completely cut off and are enclosed by a firm connective tissue capsule; a number of these may unite and form a dense mass of fibrous tissue in the meshes of which are spaces of about the size of a large pea in which at times hooklets and scolices may be found.

The fluid contained in the young cysts is clear, of a specific gravity of one thousand and five to nine or slightly higher, and contains no albumin except after a number of tappings; at times traces of sugar, succinic acid and hæmatoidin are present. Scolices and hooklets are usually found and are characteristic of hydatid disease.

The cysts vary in size from that of a pin head to five inches (12 cm.) or more in diameter and are of slow growth; the parasite may remain alive perhaps as long as twenty years. When death finally takes place the cyst walls contract and the contents becomes inspissated; partial calcification may occur. Rupture into the bile ducts, the vena cava, the intestine and elsewhere may take place and is a serious complication; the same is true of suppuration.

Symptoms. Small cysts are often unsuspected until revealed at autopsy. The larger ones give rise to the symptoms of hepatic tumor associated with a very slow and gradual decline in health. The large cysts cause a dragging sensation referred to the region of the liver, jaundice, if there is obstruction to the flow of bile, and when there is interference with the action of the heart or lungs, dyspnoea and irregular cardiac action.

Suppuration gives rise to a septic temperature with rigors and sweats and, if rupture takes place, various symptoms result depending upon the site of the rupture. Invasion of the lungs may be accompanied by the expectoration of sputum containing hooklets; rupture into the bile passages is succeeded by jaundice and by the evacuation of fæces in which hooklets may be found; rupture into the stomach may be followed by vomiting of hooklets and cysts;

the bursting of a cyst into the vena cava causes interference with the right, heart and, later, thrombosis of the lungs due to the lodgment of cysts. The cysts may also rupture into the pericardium in which case pericarditis ensues; into the peritonæal cavity with resulting peritonitis; or externally through the abdominal wall. Urticaria may appear coincident with rupture or even with aspiration, due perhaps to the absorption of a toxic material contained in the fluid.

The physical signs depend upon the situation of the tumor. Cysts near the upper surface of the liver may manifest themselves by demonstrable elastic or fluctuating swellings and may give the so-called hydatid fremitus which is elicited by applying one hand to the tumor and at the same time percussing lightly with the other. The fremitus is evidenced by a vibrating or trembling movement thought to be produced by the impact of the daughter cysts against one another. A furrow may appear on deep inspiration below the costal margin and over the cyst (Lennhoff's sign).

Diagnosis. This often requires puncture and aspiration of the cyst contents for its confirmation; the characteristics of the fluid withdrawn are as described above. The presence of hooklets is pathognomonic, and that of glucose, probable evidence of hydatid disease. Hepatic syphilis may be differentiated by its history; cancer of the liver by its more rapid cachexia; and pancreatic cysts by their being situated further to the left than the right lobe of the liver which is the normal seat of hydatid disease.

Prognosis. This in instances of the affection which are characterized by evident symptoms is unfavorable, unless operative interference is undertaken, except in the instance of spontaneous external rupture.

Treatment. Prophylaxis consists in impounding and destroying stray dogs and also in decreasing the number of these animals by means of an increased license fee. Strict cleanliness should be observed by those who keep dogs in the house as the ova are to a very great extent conveyed by the fæces of these animals. When the disease is prevalent all drinking water should be filtered and boiled and all fruit and vegetables which are eaten uncooked must be thoroughly washed with filtered and boiled water. Meat should be inspected for the echinococcus and all the offal of infected sheep and oxen should be burned lest it be eaten by dogs. Pet dogs should receive an anthelmintic about once a year.

Numerous drugs have been employed in the treatment of echinococcus disease but none of them has proved of any benefit, the only efficient curative means which we possess being surgical.

Simple aspiration of the cyst contents, a canula of moderate size being employed, may result in cure, but is not to be undertaken without due consideration, for severe symptoms and even death has been known to follow the operation. Aspiration is contra-indicated if suppuration is present. Aspiration with injection of antiseptic solutions, such as one to one

thousand mercury bichloride, five percent. copper sulphate, and one-half percent. beta-naphthol has been recommended but is not without danger and is to be avoided.

The treatment by means of electrolysis is carried out by passing two needles, each connected to the negative pole of a galvanic battery, into the cyst, while a sponge electrode, attached to the positive pole, is applied externally to the skin of the abdomen over the cyst. Success has followed this method in a few instances but it is not to be advised.

Radical surgical treatment should always be employed when possible, the object being to remove the cyst wall and its contents entire; if this is impracticable simple evacuation of the fluid may result in cure. When suppuration has taken place the management of the condition is identical with that of abscess.

Other Parasites of the Liver.

The liver is subject to diseases due to other forms of parasites, but these are rare and of interest rather to the pathologist than the practitioner. The *pentastomum denticulatum*, the larva of the *pentastomum* or *linguatula tænioides*, may be found in the organ. This is a lancet-shaped worm, the male being slightly less than an inch (1.8 to 2.5 ctm.) long while the length of the female is from three to five inches (8 to 12 ctm.).

The *coccidium oviforme* is common in the liver of the rabbit and may be found in the human being where it produces whitish nodules varying in size from that of a pin head to that of a small pea. The accompanying symptoms are intermittent fever, nausea, diarrhœa, and enlargement and tenderness of the liver.

The *cysticercus cellulosæ* is rarely observed in the liver of man.

DISEASES OF THE HEPATIC BLOOD-VESSELS.

Anæmia of the liver is productive of no especial symptoms. The anæmic condition which is observed after death in the liver of amyloid or fatty degeneration is probably not an index of the state of the organ during life.

Hyperæmia of the liver occurs in two varieties:

1. *Active Hyperæmia* takes place after eating a full meal and is especially marked in individuals who eat and drink excessively; in these subjects the condition may even be continuous. If the over-eating and drinking is persisted in, functional disturbances and even organic structural change, consisting in an over-production of connective tissue, may result. Active hyperæmia also occurs in diabetes mellitus and in the acute infectious diseases and as a result of suppressed menstruation and after the suppression of a hæmorrhoidal flux.

Symptoms. These are not marked nor important. The condition may

be the cause of the distress and feeling of weight of which persons who habitually eat and drink too much complain and which is referred to the region of the liver. The size of the organ is probably subject to daily fluctuations.

Treatment. This consists chiefly in dietetic measures; a moderate and easily digestible diet comprised of milk, thin soups, etc., should be substituted for that to which the patient has been accustomed. Plenty of water should be taken but alcohol, with fats and sugar, should be forbidden.

The pain and discomfort over the liver, if severe, may be relieved by the application of flaxseed poultices, cold compresses, or dry cups. Intestinal antiseptics, especially bismuth naphtholate or tetraiodophenolphthaleinate, in doses of five grains (0.30) three times a day should be given, any gastric irritation should receive appropriate treatment, and the bowels should be kept freely open by means of fractional doses of calomel and the saline laxative waters. Ammonium chloride in twenty-grain (1.30) doses is said to have some influence in decreasing the congestion of the affected organ.

In many instances a sojourn at one of the spas such as Saratoga, where the Hathorn water is particularly indicated, is advisable; Vichy upon the continent of Europe is recommended as a resort for these patients.

2. *Passive Hyperæmia* is a much more common and important affection than the foregoing.

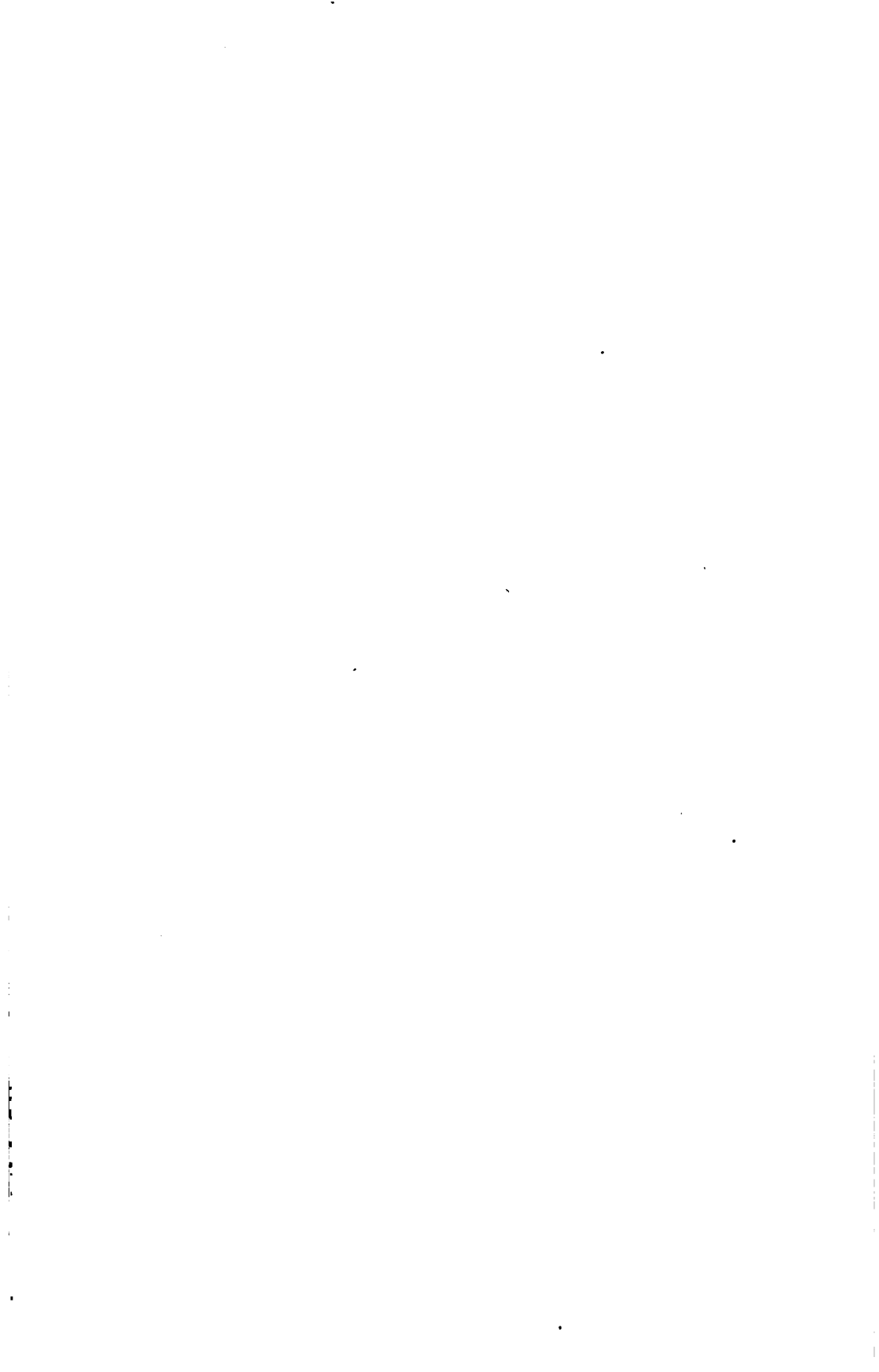
Ætiology. The condition is the result of obstruction to the flow of blood through the liver to the heart. The chief cause is valvular endocarditis but passive congestion of the liver also occurs in pulmonary emphysema and sclerosis, thoracic tumors, pleuritic diseases, and any condition in which pressure is exerted upon the vena cava.

Pathology. The liver is increased in size, firm in consistence, and is dark red in color. Its vessels are distended with blood, the intra-lobular veins and the neighboring capillaries being especially affected in this respect. On section the "nutmeg" appearance, which is the result of the alternating hyperæmia and anæmia of the hepatic and portal districts, is apparent. The increasing distention of the vessels in the central portion of the lobules finally results in an atrophy of the adjacent liver cells; there is a deposition of dark pigment, the blood-vessels are finally occluded and there is an increase of connective tissue. In the final stage of chronic passive congestion the organ is decreased in size but its surface is smooth in contradistinction to the condition obtaining in atrophic cirrhosis in which the surface of the liver is roughened.

Symptoms. There is usually gastric irritation with vomiting, sometimes of blood; ascites, at times followed by general œdema, is common in the later stages. There may be slight jaundice, with dark urine and light colored stools.

The physical signs consist of a primary enlargement of the liver, often with tenderness, followed by a contraction of the organ. The enlarged liver

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