

with the effect to produce alarming symptoms of depression, anxiety, almost of collapse.

Course, Duration, and Termination.—The course of the disease is much affected by the hygienic surroundings of the patient and by the constitutional state of those attacked. During the late war, the cases of mumps were accompanied by high fever, often delirium, and by great depression of the vital powers; pneumonia was a not unfrequent complication, and those who recovered had a tedious convalescence, the blood being much impoverished and the body emaciated. Under ordinary circumstances, mumps is a mild disease, which always terminates in recovery, its duration varying from four to ten or twelve days. The importance of mumps is to be regarded from another point of view. In some persons, the subjects of a dyscrasia, the morbid condition is awakened from its dormant state by an attack of mumps. The tubercular diathesis is the most common of these. Rarely has the gland suppurated, when attacked by mumps, but suppuration is the usual result when an inflammation of the parotid occurs in the course of typhoid fever. Atrophy is said to have taken place, but this must be an excessively uncommon event. The glands to which translation has occurred usually recover in a few days, without receiving any injury. The author has seen several cases in which the testes were injured—the damage consisting not in atrophy, but in an epididymitis, with occlusion of the spermatic duct.

Diagnosis.—The prevalence of an epidemic, the occurrence of swelling in the parotid gland with fever, and the subsidence of the swelling and fever in a few days, are clinical features which readily separate mumps from other affections. In children having bad teeth there may be produced a swelling of the parotid and submaxillary glands, but here the pain and swelling about the tooth will explain the nature of the case. Inflammation and suppuration of the parotid will be differentiated by the formation of pus and by the usual symptoms of glandular inflammation.

Treatment.—As this is a self-limited disease for which we have no remedy, it is wisest to attempt no perturbing treatment. Relief to the pain is best afforded by some warm applications, and by the internal use of morphine and quinine. A mild laxative should be administered, and, if the skin is hot and dry, the body may be sponged off with cold water, and some tincture of aconite administered. Recent observations have apparently demonstrated that pilocarpus possesses a peculiar curative power. This may be given in the form of the fluid extract, or of the alkaloid pilocarpine, and is well worthy of further trials. The patient should be kept in-doors, and every effort made to avoid the least contusion of the testes.

MALARIAL DISEASES.

INTERMITTENT AND REMITTENT FEVERS.

Definition.—*Malarial fevers* are characterized by their prevalence in certain regions of the world known to produce the poison, *malaria*, by their periodicity, and by the regular succession of the cold, hot, and sweating stage. Various designations have been applied to these forms of fever, such as *fever and ague*, *chills*, *bilious fever*, *bilious remittent*, etc.

Causes.—The great etiological factor is *malaria*. The telluric and other conditions favorable to the development of malaria exist largely in this country, along the Atlantic seaboard as far north as Boston; in all that great interior region drained by the Mississippi and its tributaries, the valley of the Sacramento on the Western coast, etc. For an exhaustive account, the reader is referred to the recent work of Lombard, or to Hirsch.* The presence in the atmosphere of a morbid principle, which is developed when certain atmospheric and telluric influences exist, is now almost universally admitted. Although the existence of such a principle is admitted, the attempts to isolate and define it have proved abortive, unless the recent discovery of Klebs and Tommasi-Crudeli supply the missing form.† The "Bacillus Malariae," which they have discovered floating in the atmosphere of the Pontine marshes, produces paroxysms of intermittent fever in the animals subjected to its action by inoculation. If this discovery is confirmed, and these rod-like bodies are proved to be the cause of those phenomena which we call malarial fever, it will prove to be the first and most important step toward permanent eradication of the disease. Malaria is also called "marsh-miasm," because of the abundance of this poison about marshes. But not all marshes produce malaria. The "Dismal Swamp," for example, is free from marsh-miasm, although apparently well adapted to produce it. Its exemption is supposed to be due to the growth of the cypress-tree. Marshes, or moist alluvium, subject to annual overflow, and exposed to the action of the sun, by

* For an account of the great interior valley of this continent, see the monumental work of Dr. Daniel Drake ("A Systematic Treatise, Historical, Etiological, and Practical, of the Principal Diseases of the Interior Valley of North America," page 723), for the reasons which induce him to accept the doctrine of the cryptogamic origin of malarial diseases.

† Klebs und Tommasi-Crudeli. "Studien über die Ursache des Wechselfiebers und über die Natur der Malaria," "Archiv für experimentelle Pathologie und Pharmacologie," Bd. xl, s. 311.

reason of evaporation or subsidence of the water, is peculiarly active in the production of the poison. Marshes that are partly brackish are worse than those entirely fresh. In this country malaria is produced more from the sandy alluvium of the river valleys subject to annual overflow and heated by the summer's sun. The alluvium and some very sandy soils of the malarial zone, not subject to overflow, also generate malaria, which is freed by turning up the soil. Cultivation and drainage, however, ultimately destroy the malaria-breeding grounds, and marshes, drained and planted, finally cease to produce the miasm. The malaria zone extends northwardly as far as the isothermal line of 59° to 59.8° Fahr., or to 63° north latitude.* It is the mean annual summer temperature, however, which determines the northern limits of malaria, and this pursues an irregular line which may be at some points above, at others below, the sixty-third parallel. One important factor is elevation, malaria not breeding above five thousand feet above the sea, which seems to be the maximum limit. The apparent exceptions to this afforded by the so-called "mountain fever" of Colorado will be alluded to hereafter. The period of the year during which malaria is most active is summer and fall—from June till November—for at this period only has the sun sufficient power. During the season of its greatest intensity, the poison may be carried up ravines to a considerable elevation, or to distant points. A position to the leeward of an infected locality is, therefore, particularly dangerous. That malaria is soluble in water and is contained in the surface-water of infected districts seems now to be well established. The author found the surface-water of Kansas to produce malarial fevers and cholera. Some trees possess the property of absorbing and fixing in their own structures noxious principles contained in the soil. The common sunflower, planted in moist lowlands, will render the air salubrious. The eucalyptus-tree has changed the nature of the malaria-breeding portions of Algiers, and is accomplishing the same sanitary result for the Campagna of Rome. The air is filtered of its disease-germs by passing through a belt of woodland; even shrubbery a few feet high serves the same purpose, and protects those living to the leeward. All ages are susceptible to malarial poisoning; and all races are equally so, except the black. Males are somewhat more liable, probably because they are more exposed to the causes. Women suffer more from the masked forms, as hemicrania, supra-orbital neuralgia, etc. All causes depressing the vital forces favor the reception of the poison and the outbreak of the disease. Especially is exposure to cold and dampness combined apt to cause an attack. Previous attacks increase the susceptibility. If those living in the midst of a malarious influence go

* The forty-seventh parallel is given by Drake (*supra*) as the northern limit in this country, and the summer temperature of 60° Fahr.

from it into a region entirely free from all suspicion of the infection, an outbreak of the fever is apt to occur. When malarial infection is established in the system, all diseases occurring will have more or less of the periodical character. The form of the malarial disease occurring will depend on the condition of the system, and on the intensity of the poison itself.

Pathological Anatomy.—The changes caused by malarial poisoning are essentially the same, except degree, in all the forms in which the disease manifests itself, and two organs (the liver and spleen) are chiefly concerned. In acute cases, the spleen is much enlarged, splenic pulp greatly increased in relative quantity, and sometimes there are infarctions. Gangrene, abscess, and rupture of the spleen are accidents which have been observed in some cases of pernicious fever. In some chronic cases the spleen undergoes enormous enlargement; its texture is tough and smooth on section, and it has a grayish slate color. This change consists in a hyperplasia of the trabeculæ with hypertrophy of the capsule, but in some cases the increased size of the organ is due to amyloid degeneration. When the organ attains to very large dimensions, it is known as "ague-cake." Usually, in chronic malarial poisoning, the spleen is somewhat enlarged, but not so much increased as to be called ague-cake, the change consisting in a diminution of the splenic pulp and an hypertrophy of the trabeculæ and capsule. The color of the spleen is grayish or slate, due to pigment deposits, which are found in greatest abundance in the walls of the blood-vessels, where it is deposited by disintegration of the red globules. Important changes take place in the liver. During an intermittent the liver becomes hyperæmic and swollen, and, if jaundice is present, very much enlarged, stained with pigment, and the portal capillaries distended with blood, and the gall-bladder filled with thick, tarry, dark-brown bile. In chronic cases the liver has a grayish tint, due to pigment deposits along the vessels; it is firm in texture, and the divided parts preserve sharp outlines; the hepatic cells are pale and filled with fat-granules. The intestinal canal also presents characteristic changes. During an acute attack there are extensive and considerable hyperæmia of the mucous membrane and more or less thickening and elevation of the solitary and agminated glands. In the chronic cases the intestinal mucous membrane has a general slate-colored hue, due to pigmentation of the capillaries. The glands, solitary and agminated, are thickened and enlarged from accumulation of their contents and hyperæmia, and thickly disseminated through the groups of Peyer are the black orifices of the follicles of Lieberkuhn. The kidneys are also affected by characteristic changes: hyperæmia during the acute attack, and subsequent alterations, as thickening of the basement membrane, the tubules filled with cast-off epithelium, the interstitial connective tissue proliferating, and more or less amyloid change in the Malpighian

tufts and small arteries.* The brain and spinal cord do not escape. In ordinary cases during an acute attack, there is more or less hyperæmia of the brain; in pernicious remittent, capillary pigment embolisms and minute extravasations occur; but more usually the condition is that of hyperæmia and œdema of the membranes and of the cerebral matter. In the lungs there may be infarctions, croupous pneumonia, etc. The heart is flabby, its muscular fiber easily torn, the right cavities distended with soft, black coagula, very loose. The changes in the blood have not been studied with accuracy. Bence Jones's discovery of a fluorescent substance in the blood and tissues has not thrown any light on the question, since this substance or rather reaction is very widely distributed and is without importance. It is true, Pepper and Rhoads found this substance diminished by malarial fever, but nothing has resulted from these observations. The white corpuscles are much increased in numbers relatively, but the most important change in the composition of the blood is the formation of pigment from the hæmoglobin, the hæmatin is set free, and is found in all the principal organs associated with the vessel-walls, and rarely collected in masses, and forming capillary embolisms.

Symptoms.—*Prodromal Stage.*—A certain period elapses after exposure before there is any disturbance in the functions. This period of incubation varies from a few hours to many weeks, the variations being due to the intensity of the poison and the susceptibility of the individual. The average which is most usual is fourteen days. In a large proportion of cases there are symptoms indicating that the infection is working. These are called prodromes. The patient has a feeling of lassitude and weariness; he suffers with backache and general muscular soreness; he has an irresistible inclination to yawn and stretch, especially in the early morning, and on cold, damp days; his head aches, tongue is coated, stomach is squeamish; toward evening his skin becomes warm and dry, his sleep is disturbed by dreams, and in the early morning a profuse sweat occurs. In other cases the prodromes consist merely in a coated tongue, yellow sclerotic, and a general yellowish hue of the skin, languor, loss of appetite, and constipation; the urine is loaded with bile-pigment, and deposits an abundance of urates. Gradually thus may the patient drift into a paroxysm of fever, without there being any distinct initial symptom—the form assumed developing by a process of selection, as it were, out of the material offered. Or the disease may begin abruptly in the midst of apparently full health, or during the puerperal state, or in the course of chronic malarial poisoning.

Intermittent Fever.—*Ague and Fever.*—There are three distinct

* The author gives the results of numerous observations and studies made during his service in the regular army, from 1857 to 1864. (See his contributions to United States "Sanitary Commission Memoirs," medical volume.)

events in every paroxysm of intermittent fever: the chill, the fever, and the sweat. When the chill comes on, there is a feeling of wretchedness, of weariness, and illness. There occur headache, backache, and soreness in the muscles of the extremities. Creeping chills are felt along the back, there are gaping and præcordial oppression, the whole surface grows cold, and, feeling extremely weary and depressed, the patient gladly betakes himself to bed; but the coldness intensifies, no matter how much covering is piled on; the fingers become blue, the lips blue, the nose pinched, the countenance shrunken, and the chilliness is now aggravated into shuddering. One fit after another of shuddering comes on; the teeth rattle together; the bed shakes. Meanwhile the pains in the head and back and limbs continue; there is extreme thirst, and often nausea and vomiting; respiration is quick and sighing, the voice is weak and tremulous; the pulse is small, rapid, and the tension high; the urine is pale, watery, and increased in quantity. Notwithstanding the overpowering sense of coldness, it is found to be objective, for the temperature begins to rise with the onset of the chill, the thermometer indicating fever whether in the axilla, mouth, or rectum. The duration of the chill varies from a mere instantaneous chilliness to several hours of shaking, the usual length of the ague being a quarter to a half hour. The chill does not terminate abruptly. The shaking subsides slowly, as a feeling of warmth gradually diffuses outwardly, or flashes occasionally through the limbs. After a time the body feels hot, the extremities grow warm, the pulse becomes fuller and stronger, the blueness of the skin is replaced by a red blush, the face is full instead of retracted, flushed instead of pallid. The pains in the back and limbs disappear, but the headache rather increases, and throbbing is felt in the temples, and with each pulsation of the carotid. The pulse grows full, rapid, and strong; respiration is more frequent and easy. The head becomes hot, feels full; there are noises in the ears; vertigo and nausea are experienced on the attempt to get up; the ideas are confused, and the mind is dull, and there may be excitement and delirium. The usual symptoms attend this feverish state—there are thirst, a dry mouth, constipation, high-colored, scanty, and acid urine. The duration of this stage varies from an hour or two to ten or twelve, and it is succeeded by the third or *sweating stage*. While the fever is raging, a gentle moisture appears on the forehead and face, and more abundantly in the axilla, groin, between the thighs, and then on the skin. Presently the moisture increases to drops, and finally pours off, wetting the shirt and the sheets. As the sweating progresses, the fever declines, the pulse becomes softer and its tension is lowered; the headache and other pains and the general muscular soreness cease; the mouth gets moist and the thirst lessens; the respiration becomes easy and regular, and the patient, although exhausted, experiences a feeling of comfort and well-

being, and often falls asleep. The sweat is acid in reaction, is rich in salts, and contains a large quantity of organic matter with fat acids, to which its animal odor is chiefly due. The urine also is acid, has a high color owing to a quantity of pigment, and contains much uric acid and urates, which are deposited abundantly on cooling. The amount of urea discharged corresponds closely with the range of temperature, and, as soon as the fit of ague begins, the production of urea increases (Ringer). A sudden decline in the amount of urea takes place during the sweating stage, and in the apyretic interval it is below the normal.* The excretion of chloride of sodium also is always increased greatly during the cold and hot stage of an ague paroxysm. These facts indicate that the increased temperature of the febrile movement represents the consumption of tissue. When the paroxysm is entirely ended by the completion of the sweating stage, in about twelve hours, on the average, from the beginning of the seizure, the patient presents evidences of the revolution through which he has passed. There is experienced a sense of exhaustion, and the functions generally are depressed; the tongue coated, the appetite poor, the epigastrium and hypochondriac regions more or less uneasy and sensitive to pressure, and the skin is slightly or considerably jaundiced. Not every ague attack is so severe, and great variations are observed as regards the several stages. Thus the chill may be a mere creeping or crawling sense of coolness along the spine, while the fever and sweat may be extremely severe. Again, the chill may be pronounced and the fever and sweat trivial; or there may be profuse sweating at regular intervals, without any but the most trivial and transient disturbances in other respects.

Course, Duration, and Termination.—After a certain interval, which is different in the several types of fever, the paroxysm recurs, and there are again presented the phenomena of chill, fever, and sweat. Intermittent fever follows a definite law of periodicity. Sometimes the paroxysms occur daily, coming on at a special time with nearly uniform particularity. This variety or type is known as *quotidian intermittent*. Again, the paroxysms occur on alternate days—on the third day, including the days of attack—and are hence known as *tertian intermittent*. In the temperate malarious regions the tertian form is the most frequent. There is still a third variety, in which the paroxysms occur on the fourth day, including the days of illness, and hence is known as *quartan intermittent*. This last variety is uncommon. Sometimes two distinct paroxysms occur on the same day, and hence we have *double quotidian*, *double tertian*, etc. The author has encountered two cases of double quotidian in the puerperal state. Other

* Dr. Joseph Jones, "Trans. Amer. Med. Association," 1859, vol. xii, p. 507; Sydney Ringer, "Medico-Chirurg. Trans.," second series, 1859, vol. xxiv, p. 361; Dr. Parke, "On the Composition of the Urine in Health and in Disease," London, 1860, p. 235.

eccentricities have been observed. Thus, a quotidian may have on alternate days corresponding paroxysms as to time and character, and may consist of two tertians. Such a variation is sometimes called a double tertian. The *triple tertian* is a variety in which there are two distinct paroxysms on one day and one paroxysm on the next; the *duplicated tertian* has two paroxysms on alternate days; and, finally, the *double quartan* has a paroxysm on one day, a milder one the next day, and a day without fever. The duration of a paroxysm of fever varies with the type: the quotidian lasts from eight to twelve hours, the tertian from six to eight, and the quartan from four to six. The paroxysms do not always occur at the same hour; if uninterfered with they anticipate, the second occurring a little earlier than the first, and the third earlier than the second. On the other hand, as the force of the attack is declining, the paroxysms are postponed. The quotidian usually begin in the early morning, the tertian toward or at noon; if not interfered with by treatment, an intermittent will ultimately terminate spontaneously, but the period at which this result will be reached depends on the climate, constitution, season, degree, in which the system has been poisoned by malaria, etc. Very mild quotidians may terminate in a month, tertians in two months or longer, and quartans many months. When malarial poisoning has thoroughly occurred, the disposition to attacks continues for a long period—often for years. Exposure to cold, errors of diet, fatigue, mental anxiety—a variety of causes, of sufficient force to disturb the functions—may excite a new attack. Very often a change of type ensues: the quotidian may become a tertian, or the gravity of the case is increased—a remittent succeeding to an intermittent fever. It is rare for an intermittent fever to terminate in death directly, but indirectly, through the various alterations occurring in malarial poisoning, a large mortality results. The course of intermittent is much diversified by the variations from the typical form known as *masked intermittent*. When an attack has been interrupted by the exhibition of the usual remedies, there may occur at the regular periods subsequently a mere temporary rise of temperature, a profuse sweat, a copious urinary discharge, an attack of diarrhoea, etc. With or without any previous manifestation of fever, those affected with malaria may suffer with various substitution diseases, as intermittent hæmaturia, pulmonary hæmorrhage, bronchitis, coryza, iritis, jaundice, diarrhoea or dysentery, vomiting, urticaria, roseola, and numerous other maladies. These substitution diseases agree in coming on at a fixed hour or nearly so, in disappearing after a time without any apparent reason, in coming on again at the appointed time or anticipating a little, and in yielding promptly to the anti-periodic while obstinately resisting other means of treatment. Probably the most common of these substitution diseases is *neuralgia* and the most usual position of this, the ophthalmic division of the

fifth; but it may occur in the other divisions of this nerve—in the occipital nerve, in the sciatic, and elsewhere. In what position soever the neuralgia appears, the attacks are periodical, and usually quotidian. When it occurs in the ophthalmic division, there are intense pain in the region of the eye and forehead and throbbing temples, the conjunctiva is injected, and the eyelids are swollen; general *malaise*, nausea and vomiting, some chilliness, elevation of temperature, and sweating are the systemic symptoms, which associate these cases with the ordinary intermittents. When sciatica occurs it may assume the intermittent or remittent form, is on the right side in the majority, and is sometimes accompanied by clonic spasms. Not frequently, attacks occur in the cardiac nerves, producing the phenomena of angina pectoris, viz., præcordial oppression and pain, a sense of impending death, great difficulty of breathing, a slow, hard pulse, cold skin, blue lips and fingers, ending with free eructations of gas, the discharge of a quantity of pale, watery urine, etc. Various nervous diseases, as delirium, puerperal mania, hallucinations, coma vigil, etc., have occurred, as those above mentioned, in substitution of malarial attacks. Besides the intermissions, the regularity in the periods of recurrence, and the promptness with which they yield to quinine, these substitution maladies may be accompanied by some of the other objective phenomena of malarial fever.

Pernicious Intermittent.—In those parts of the United States where the malaria is most concentrated and the malarial fevers most severe, the ordinary intermittent may assume a most formidable character, termed *pernicious* in scientific works, and popularly known as *congestive*. That an attack of intermittent will assume a pernicious character is not announced in advance. Sometimes the condition of exhaustion induced by a severe attack of cholera morbus may invite a paroxysm which assumes the pernicious character, or the state of the patient may be rendered unfavorable by some other malady, or there may be present some symptoms of cerebral disturbance, but in general there is nothing to indicate the approach of the severe type. Usually, the case has the ordinary aspect of an intermittent for the first, second, and third paroxysm. There may be a gradual increase in the severity of each attack, or the usual type may be followed by a pernicious one. It is not often that the first pernicious attack proves fatal, but a repetition of them becomes more and more dangerous, and after the first any succeeding attack may be fatal. The pernicious attacks assume several forms—the algid, choleric, diaphoretic, the pneumonic, the nephritic, and the cerebro-spinal.* In the *algid* form the depression of the heart, which is its distinctive feature, comes on either in the fever or sweating stage. While intense internal heat is experienced by the

* Jaccoud, *op. cit.*, p. 605.

patient, the surface becomes cold, livid, and cyanosed, the pulse small and exceedingly rapid, the action of the heart feeble; the skin is covered with a cold, sticky sweat, but the mind is undisturbed. If death occurs, the condition of coldness and depression increases, but if recovery, after a longer or shorter duration of the algid state, the action of the heart grows a little stronger, and gradually warmth is restored to the surface. In the *choleric* variety of pernicious fever there is produced an algid state resembling that of cholera, by an uncontrollable vomiting and purging, and the resemblance is carried to the stage of reaction; for if the patient emerge from the condition of collapse he experiences the fever of reaction—the typhoid state—which occurs under similar circumstances in cholera. In the *sweating or diaphoretic* variety of pernicious intermittent no notable change in the demeanor of the case takes place until the stage of sweating arrives, when, not only does an enormous transpiration occur through the skin, but the temperature falls below the normal, the circulation becomes exceedingly depressed, the surface cold and cyanosed; the urinary secretion is greatly diminished or totally suppressed, and in many cases there are passed large, whitish stools, without bile. Under such circumstances there may be more or less jaundice, and by many authors those cases characterized by a marked biliary derangement are erected into a distinct class, as *pernicious icteric* (Jaccoud). When the vaso-motor disturbance, which underlies the forms of pernicious intermittent, already described, is precipitated on some internal organ, there will ensue, in addition to the condition of coldness, cyanosis, and feeble circulation, the symptoms of some particular internal malady—pneumonia or pleurisy, for example. A malarial pneumonia pursuing the ordinary course, the symptoms remitting in accordance with the type of the malarial fever, will, if the pernicious symptoms set in, assume, in a short time, a condition of extreme danger, owing to the disturbance in the pulmonary circulation. When the vaso-motor derangement affects the kidneys during the course of pernicious intermittent, there is produced the *nephritic form* of pernicious fever, and the signs are hæmaturia, albuminuria, or suppression of urine. The most common form of pernicious intermittent is that affecting the nervous centers. There are usually some preliminary symptoms, as headache, vertigo, and a soporose state, which are present during the first paroxysms, or in the interval preceding the pernicious attack. During the fever stage the patient falls into a profound coma, and this is all the more dangerous, because it may resemble natural sleep. In the first attack, the patient usually rallies during the sweating stage, in twelve to twenty-four hours, or the coma may simply deepen, the heart become more and more depressed until death. The succeeding attacks are usually fatal. This comatose form may assume an appearance of apparent death, the patient being in a cataleptic condition, or it may be preceded by faint-