ing-fits, a state of genuine coma then coming on. In still other cases this cerebral form of pernicious fever may assume the appearance of maniacal delirium, or it may affect the brain and cord simultaneously, causing tonic and clonic spasms, etc. In this country the most frequent varieties of pernicious intermittent are the algid, the choleraic, the pneumonic, and the comatose.

Sequelæ of Intermittent Fever.—When attacks of intermittent fever have been interrupted by appropriate treatment, relapses are apt to occur. In fact, by the treatment only the objective phenomena of fever may have been removed, and consequently but a certain time will be required to develop new paroxysms. In cases thus temporarily suspended and apparently well, it will be found on close inspection that there are still occurring in regular sequence certain disturbances. The thermometer may show some slight elevation of temperature; there may be a distinct sweat, or a profuse urinary discharge may occur, and, after a period determined by the type, the paroxysms will recur. These relapses are said to appear on the seventh, fourteenth, and twenty-first days, but it is more correct to state that the periods of recurrence are multiples of the first or former attacks. If, for example, the case is tertian, the first relapse would occur on the sixth day; if quotidian, relapses would take place on the third, sixth, ninth, and twelfth days; and thus on. Not only the regular cases, but the various masked and pernicious forms, manifest the same tendency and pursue the same laws as regards the relapses. The tendency to the occurrence of relapses is much affected by age—is much greater under twenty, and declines rapidly after twenty. The time at which they occur varies greatly, from one week to six months, but the probability of a relapse is very slight after six weeks have passed. The type of the disease frequently changes in undergoing a relapse, the tendency being to more frequent attacks, the tertians becoming quotidian. The tendency to relapses is due to the persistence of the conditions which determined the first seizure. The result of the long-continued action of malaria is most disastrous. The blood loses its red globules, while the white diminish in size and increase in number; the ankles become œdematous; the liver and spleen enlarge; the skin is yellow, earthy, or jaundiced; the body emaciates; the appetite is poor, the digestion feeble, the stools clay-colored, and the urine may contain albumen, and is deeply colored with bile-pigment; fluid accumulates in the peritoneal cavity, etc. Palpitation of the heart and a venous hum over the course of the great vessels occur because of the watery state of the blood, and for the same reason epistaxis takes place and the menses become profuse. The changes which affect the composition of the blood are due to various causes—to the interference by stomach and intestinal troubles with the primary assimilation, to the morbid state of the blood-making organs, especially to the destruction in the spleen

of the red-blood globules, and to the conversion of hæmatin into pigment, which we have shown to take place at various points. An important fact is the accumulation of this pigment, and its almost universal distribution throughout the body. The mischief done by pigment embolisms is doubtless very great. Besides those changes belonging to chronic malarial intoxication and the sequelæ above mentioned, there are various maladies of high importance, which may have their origin in the malarial cachexia. Among these are nephritis, amyloid degeneration of the liver, kidneys, spleen, and intestinal glands; sclerosis of the liver, anæmia, dropsy, tuberculosis, neuralgia, epilepsy, hemiplegia, mania with suicidal tendency, etc.

Diagnosis.—A case of intermittent, complete at all points, could hardly be confounded with any other malady. It may be mistaken for pyæmia, in which there are chills, fever, and sweats, with an apyretic interval. It differs, however, from pyæmia in its origin, and in the clinical course; intermittent is due to a supposed miasm—pyæmia to wounds, suppuration of veins, etc.; intermittent is regular in its course—pyæmia is very irregular, no defined intervals occurring; intermittent is a benign affection, promptly cured by quinia—pyæmia is a fatal disease, over which quinia has no influence. Masked intermittents are differentiated from the local maladies whose form they assume, by the fact that malaria is abundant, that these diseases are distinctly periodical, and that they yield to the remedies for malarial diseases. The diagnosis of the various pernicious forms is very difficult. It ought to be remembered that the pernicious attack has occurred at a time when the regular paroxysm is due, and that probably a strong malarial influence prevails. The comatose variety is often preceded by symptoms indicative of the disturbance in the intracranial circulation, such as headache, vertigo, sopor, etc.

Remittent Fever.—The remittent fever of this country is known as *bilious fever* and *bilious remittent fever*. The designation *bilious* has been applied because of the prominence of the symptoms referable to the hepatic function. Every summer and fall this disease prevails largely through the South and West. The author saw in Kansas, in 1857, at the military post of Fort Leavenworth, a great many examples of the severe form of remittent fever prevalent in that locality. The cases of remittent are divisible into three groups—*mild*, *severe*, and *grave*. These divisions, generally recognized by systematic writers, are based on clinical experience. In the mildest form the fever continues for four or five days, when distinct intermissions occur; the remissions are well defined from the beginning, and increase day by day into the complete intermission. Usually an attack of remittent fever is preceded or accompanied by a coated tongue, yellow and thick; a heavy, offensive breath; nausea and vomiting—the matters ejected consisting, for the most part, of acid mucus and bile; violent

headache, especially of the frontal region, ringing in the ears, throbbing temples, and a chill of moderate severity, which marks the real onset of the disease. The remission is every day (quotidian type), or on alternate days (tertian type), and is marked by a distinct sweat, which coincides with the decline of temperature. More or less chilliness, sometimes a well-defined chill, begins the new paroxysm. Restlessness and wakefulness at night, bleeding at the nose, a slight bronchitis, and an eruption of herpes, are also symptoms of this form. In the *severe form* the fever is less broken by remissions, and assumes a type approaching the continued. About the third day there are beginning symptoms of cerebral derangement, as stupor and delirium; the tongue is dry and cracked; the spleen and liver are enlarged and swollen; a well-marked icterus stains the skin, and in some cases pernicious symptoms are developed out of a complicating dysentery or pneumonia. Such a case may extend over two weeks, and gradually abate into an intermittent, or terminate fatally, with pernicious phenomena, in collapse. In the *grave form* the case may begin as in the severe variety; in the first week the exacerbations and remissions will be irregular, perhaps, with a tendency, constantly increasing, toward a continued type, delirium and stupor coming on, and deepening into coma. Instead of a gradual progress toward a typhoid state, the case may begin with serious symptoms, and in a few hours delirium, jaundice, hæmorrhages, albuminuria, or suppression of urine may appear. In other cases, choleraic symptoms or dysentery may come on, purulent effusions into the serous sacs may occur, a pneumonia may develop, abscess may form in the liver, and gangrene of the skin may result. A form of remittent fever of great severity, and having close analogies with yellow fever, is that known as the *hæmorrhagic bilious fever*. It may commence as an ordinary intermittent, but the grave symptoms rapidly develop. The chills are protracted and violent, intense headache and backache are then experienced, a burning pain passes from the pharynx to the stomach, very depressing nausea now comes on with vomiting of bilious matter, obstinate constipation is succeeded by a bilious diarrhœa, the urine is copious and dark in color, the skin assumes an icteric hue, and very considerable swelling of the spleen and liver occurs. Meanwhile the fever becomes remittent and the remissions less and less marked, the pulse rapidly declines in volume and strength, the skin is covered with a cold sweat, the features shrink, hæmorrhages occur from the mucous surfaces, the urine lessens greatly in quantity or is entirely suppressed, and the fatal result is reached in an increasing coma. Notwithstanding the formidable character of this variety of remittent fever, a fatal result is not inevitable, if the subject be vigorous, and the treatment properly carried out before the onset of coma, which may appear on the fourth, fifth, or sixth day. So strong is the resemblance of these cases to yellow fever

that they are doubtless often confounded during the epidemic prevalence of the latter. No means of distinction between them is so satisfactory as the action of quinine, which will arrest the one but not affect the other.

Treatment.—The questions of public and private hygiene involved in the prevention of malaria are beyond the scope of this work. The direction which the investigation of physicians should take is indicated in the etiological chapter. The measures of prophylaxis, as affecting individuals, must, however, receive some attention. Those living in malarious regions, susceptible to the action of the poison, must avoid all excesses of every kind, exposure to fatigue, to heat, and to rapid alternations of temperature. Exposure to the night air and to the early morning air is also to be avoided. Before leaving the house in the morning a substantial breakfast should be taken, and a prophylactic dose of quinine, if the season of malarial production has arrived—summer and fall. The experience now accumulated as to the prophylactic power of quinine puts this question beyond controversy. The English naval experience on the coast of Africa, the military experiences in India and Africa, and our own experience during the civil war, have demonstrated that the daily administration of a sufficient dose will procure immunity against malarial infection. The quantity required for this purpose is differently stated, but should be determined by the supposed intensity of the malarial poison, and may be put at from five to ten grains daily. It is best administered in the early morning, and in some black coffee, or dissolved by the aid of sulphuric acid in water, in pill form, or simply in water. The practice pursued in our army during the war, of giving quinine in whisky, is wrong in principle, and the results were not good, therapeutically or morally. The effects of quinine as a prophylactic are much more certain than when used in a corresponding way to prevent relapses. In fact, it is much easier to prevent than to cure the disease. If there is no time to prevent the paroxysm, we possess means to abort it at the chill stage. The expedients resorted to for this purpose are very numerous, and include nitrite-of-amyl inhalations; chloroform by inhalation and by the stomach; the hypodermatic injection of morphine and of pilocarpine. From a half-drachm to a drachm (fluid) of chloroform, given in some sweetened water, by the stomach, or administered by inhalation, will usually arrest the chill, and greatly lessen the severity and duration of the succeeding stages. Amyl nitrite is also quite efficient in bringing on reaction and abbreviating the chill stage, but it exercises little or no influence on the other stages. Recent observations seem to prove that pilocarpine, of all the remedies hitherto proposed for this purpose, exercises the most remarkable influence.* If

* Dr. Griswold, August 16, 1879, "New York Medical Record."

administered as the chill is coming on, it stops it, and substitutes a sweating stage, thus preventing the full evolution of the paroxysm. The most remarkable point is that the disease seems arrested, and relapses prevented, in a considerable proportion of the cases. If these observations are confirmed, we shall have in pilocarpine the most useful remedy in the treatment of intermittents. From one twelfth to one sixth grain of the nitrate or muriate of pilocarpine, given hypodermatically, is the appropriate dose for an adult, and this should be given as the chill is about to occur. A corresponding dose (one sixth to one fourth grain) can be given by the stomach half an hour before the chill-time. If the chill has anything of the pernicious character about it, the most efficient remedy is the hypodermatic injection of morphine and atropine, or of morphine alone. In any of the modes in which the pernicious attacks come on, the remedies are two—morphine and quinine—and the mode of administration subcutaneous. The usual means of applying artificial heat are of course to be used, but no time should be expended on anything until morphine and quinine shall have been injected subcutaneously. From one twelfth to one fourth of a grain of morphine can be given to an adult. Maximum doses of quinine are required. Much difficulty has hitherto been experienced in preparing a suitable solution of quinine. As the muriate of quinine and the bromide are soluble to a much larger extent than the sulphate, they may be used for solution in water only; but as the quantity required is so great, a solution of the sulphate, dissolved by the aid of sulphuric acid, is generally preferred.* The dose of quinine injected in a pernicious case should not be less than twenty grains, and this may be repeated two or three times until reaction is established. In the absence of the method or means of hypodermatic injection, quinine and morphine may be administered by the rectum, if insensibility or irritability of the stomach prevents the introduction of remedies into that viscus. If the approach of a pernicious intermittent is indicated by the presence of head-symptoms—drowsiness, headache, vertigo, etc.—the administration of full doses of quinine should not be delayed.

In the treatment of ordinary intermittents, our attention is directed to the prevention of future attacks. Although no preparatory treatment is actually required, better results are obtained if the gastro-intestinal derangement is removed. If the tongue is heavily furred,

* ℞ Quininæ disulph., gr. 50; acid. sulphuric. dil., ♏ 100; aquæ font., ℥ j; acid. carbol. liq., ♏ 5. Solve.

For various formulæ, see "Manual of Hypodermic Medication," by the author of this work, third edition, p. 213.

Note.—The carbamidated muriate of quinine—a combination of muriate of quinine and urea—has been found to be the most effective as it is the most soluble of all the preparations, and is preferable to all others.

the stomach irritable, and the bowels constipated, the absorption of quinine is much hindered and its powers lessened. A grain of calomel, followed in four or six hours by a Sedlitz-powder, or the latter without the calomel, will assist in the absorption of the quinine. The old plan of an emetic, followed by "ten of ten"—ten of calomel, ten of jalap—is no longer pursued. Opinions still differ as to the period of administration, and the dose of quinine, in the treatment of intermittent fever; but these differences exist among those only who have but limited experience in the management of severe intermittents. The question is, shall we use small doses, frequently repeated in the interval, or a single full dose at the proper period before the access of the paroxysm? The latter is better, for these reasons: the whole effect of the quinine is obtained at the right time, a less quantity suffices, and the curative effect is greater. As the elimination of quinine takes place with considerable rapidity, appearing in the urine in three hours after it is swallowed, it is obvious that, if the administration has been distributed over twelve hours, the effects of the first doses are expended before the last are given. The amount necessary to arrest the paroxysms should, therefore, be given at a dose, or within a short period, and at a time preceding the chill sufficient to obtain the maximum effect, which is about three hours. For an ordinary intermittent from fifteen to twenty grains of quinine are necessary to stop the paroxysms. To prevent relapses, quinine must be given at certain periods: on the second or third day, and on the fourth and sixth days after the date of the first administration, according to the type. Having in view the tendency to relapse at subsequent periods, quinine should be again given on the twelfth to the fourteenth, and on the nineteenth to the twenty-first days. As, in cases of malarial cachexia, we have to deal with certain morbid conditions of the liver, spleen, intestines, blood, etc., attention must be given to them if we would effect a cure. To improve the condition of the blood, the chalybeates, notably the sulphate of iron, must be employed; and these remedies are the more efficacious if combined with arsenic and other tonics. During the intervals between the administration of quinine, the remedies best adapted to the existing state of malarial cachexia are, besides iron, arsenic and eucalyptus. Various substitutes for the expensive quinine are now largely administered. Probably the best of them are the combined alkaloids of cinchona in an impure form, as used by the authorities of India. Quinidine may be prescribed in the same quantity as quinine, and seems about as effective. Cinchonine is also quite effective in twice the quantity as quinine. The author has found the salicylate of cinchonidine quite a good antiperiodic, and next, probably, to the salts of quinine in power. Salicylic acid has some antiperiodic property, but greatly inferior to quinine; it has been combined with quinine to form salicylate, but its precise

value has not been shown. Eucalyptus is a most useful antiperiodic, but it is adapted rather to the treatment of malarial cachexia, and to prevent relapses. Iodine possesses a high degree of utility in the treatment of malarial intermittents, and may be used in substitution for quinine, or to remove some of the secondary lesions. Lugol's solution is a convenient form in which to administer it. The combination of iodine and carbolic acid is highly efficient (℞ Acid. carbol. ʒ j, tinct. iodi comp. ʒ iij. M. Sig. Four drops every four hours in sufficient water). This combination may be depended on exclusively in some cases. For the removal of the various morbid alterations caused by malaria, the combination of iodide of ammonium and arsenic is most effective (to a solution of iodide of ammonium, giving five grains to the dose, add three drops of Fowler's solution). The practitioner will find this most useful in cases of chronic malarial poisoning with frequent intermittents. For the treatment of enlarged spleen there is, besides the exhibition of quinine, no remedy more efficacious than the ointment of the red iodide of mercury, which is rubbed in daily over the splenic region in the sunshine, until soreness of the skin compels a suspension. For the gastro-intestinal catarrh, the duodenal catarrh, and the catarrhal jaundice, which occur so frequently in malarious regions, with or without any febrile movement, the most serviceable remedies are two, the phosphate or benzoate of soda, three times a day, and a morning and evening dose of ten grains of quinine.

In *the treatment of remittent fever* the same general plan is to be pursued as in the management of intermittents. It is not necessary to await the remission, but the antiperiodic may be given at once, yet it is certainly true that the remedy in corresponding dose is much more efficient if given during the sweating. The author's first experience in the administration of large doses of quinine was gained under that able physician and medical officer, the late surgeon John M. Cuyler, M. D., of the Army Medical Staff, then stationed (1857) at Fort Leavenworth, Kansas. The author, a recent graduate in medicine, and just then admitted to the army, was very fortunate in being able to witness the practice of so experienced and able a physician. The large hospital of the post contained a number of the severe remittent fevers of that locality. They were broken up into intermittents and sent out of the hospital in a week, usually by the routine prescription of thirty grains of quinine the first morning, twenty the second, fifteen the third, and ten the fourth—single doses, and all taken at once. As remittent fever is due to a more intense and concentrated poison, no delay in the efficient use of quinine is proper; otherwise, it may lapse into the typhoid state, and be confounded with typhoid fever. The intermittent remainder requires the same management as an ordinary intermittent. Should there be, as is usual, great irritability of the stomach, quinine solution can be given by the rectum, and the usual remedies applied for the relief of the nausea and vomiting. If the rectum is also irritable and rejects the remedy, it must then be given hypodermatically. Whenever it is practicable to do so, the antiperiodic should be administered during the remission in the sweating stage. The almost numberless masked intermittents and remittents require the same management as an ordinary case of intermittent, except that they are more difficult to arrest and require maximum doses of quinine.

DISORDERS OF NUTRITION.

SCROFULA.

Definition.—By *scrofula* is meant a constitutional dyscrasia, hereditary or acquired, characterized by changes inflammatory and hyperplastic, occurring for the most part in the lymphatic system, the skin, mucous membranes, connective tissue, osseous structures, and viscera. Scrofula is also known as *struma*, the *strumous diathesis*, *tuberculosis*, the *tuberculous diathesis*, etc.

Causes.—Heredity is the most influential factor in its pathogenesis, but it is the predisposition and not the disease itself which is inherited. Those cases are said to be *innate* in which, owing to conditions present in the parents, not themselves strumous, a scrofulous constitution is transmitted to their offspring. Such conditions are old age, blood-relations, cachexia of syphilis, etc., which existing in the parents, the offspring may possess the strumous constitution. Acquired scrofula is the product of various evil hygienic influences, as crowding, bad air, poor food, insufficient clothing, overwork, especially in youth, and in dark, damp, and crowded apartments. Recent observations, especially those of Cohnheim, which indicate the essentially infective nature of tubercle—a product of scrofula—show the great danger of inducing tuberculosis in children by the consumption of milk from tuberculous cows. It is probable that many cases of acquired scrofula, especially in cities, are derived from this source. If a scrofulous predisposition exist in a latent state, it may be roused into activity by various causes. Certain diseases, as measles, whooping-cough, typhoid fever, etc., will have this effect. Scrofula manifests itself usually about the time of the first dentition, and increases from the third to the seventh year. It is rare for the manifestations to appear only after pu-