for several weeks, is improperly or imperfectly treated, and on exposure the chills recur. This may be repeated for several months until the patient presents the two striking features of malarial cachexia—namely, *anæmia* and an *enlarged spleen*. Cases developing without chills or without febrile paroxysms are almost unknown in this region. They may occur, however, in intensely malarial districts, but in such cases the patients have fever, though chills may not supervene. The most pronounced types of malarial cachexia which we meet with here are in sailors from the West Indies and Central America. There is profound anæmia; the blood count may be as low as one million per cubic millimetre; the skin has a saffron-yellow or lemon tint, not often the light-yellow tint of pernicious anæmia, but a darker, dirtier yellow. The spleen is greatly enlarged, firm, and hard. It rarely reaches the dimensions of the large leukæmic organ, but comes next to it in size.

The general symptoms are those of ordinary anæmia—breathlessness on exertion, œdema of the ankles, hæmorrhages, particularly into the retina, as noted by Stephen Mackenzie. Occasionally the bleeding is severe, and I have twice known fatal hæmatemesis to occur in association with the enlarged spleen. The fever is variable. The temperature may be low for days, not reaching above 99·5°. In other instances there may be irregular fever, and the temperature rises gradually to 102·5° to 103°. The cases in fact present a picture of splenic anæmia.

With careful treatment the outlook is good, and a majority of cases recover. The spleen is gradually reduced in size, but it may take several months or, indeed, in some instances, several years before the ague-cake entirely disappears.

Among the rarer symptoms which may develop as a result of malarial intoxication may be mentioned *paraplegia*, cases of which have been described by Gibney, Suckling, and others. Some of the cases are doubtful, and have been attributed to malaria simply because the paralysis was intermittent. It is a condition of extreme rarity. No case is mentioned by Kelsch and Kiener. Suckling's case had had several attacks of malaria, the last of which preceded by about two weeks the onset of the nervous symptoms, which were headache, giddiness, loss of speech, and paraplegia. The attack was transient, but he had a subsequent attack which also followed an ague-fit. The patient was an old soldier who had had syphilis, a point which somewhat complicated the case. *Orchitis* has been described as developing in malaria by Charvot in Algiers and Fedeli in Rome.

Diagnosis.—The diagnosis of the various forms of malaria is usually easy. The continued and remittent and certain of the pernicious cases offer difficulties, which, however, are now greatly lessened or entirely overcome since Laveran's researches have given us a positive diagnostic indication. Many forms of intermittent pyrexia are mistaken for malarial fever, particularly the initial chills of tuberculosis and of septic infection.

If the practitioner will take to heart the lesson that an intermittent fever which resists quinine is not malarial, he will avoid many errors in diagnosis. In the so-called masked intermittent or dumb ague, the febrile manifestations are more irregular and the symptoms less pronounced; but occasionally chills occur, and the therapeutical test usually removes every doubt in the diagnosis.

The malarial poison is supposed to influence many affections in a remarkable way, giving to them a paroxysmal character. A whole series of minor ailments and some more severe ones, such as neuralgia, are attributed to certain occult effects of paludism. The more closely such cases are investigated the less definite appears the connection with malaria. Practitioners in districts entirely exempt from the disease have to deal with ailments which present the same odd periodicity, and which the physicians of the Atlantic coast attribute to a "touch of malaria."

Treatment.—We do not know as yet how the poison reaches the system. Infection seems most liable to occur at night. In regions in which the disease prevails extensively the drinking-water should be boiled. Persons going to a malarial region should take about ten grains of quinine daily. During the paroxysm the patient should, in the cold stage, be wrapped in blankets and given hot drinks. The reactionary fever is rarely dangerous even if it reaches a high grade. The body may, however, be sponged. Quinine should then be ordered, so as to check the on-coming paroxysm. It should be given in solution. From ten to thirty grains in divided doses through the day will almost invariably stop the next paroxysm. No preparatory treatment is necessary; no other drugs need be given. The remedy is a specific in the truest sense of the term. In not a single instance among the several hundred cases of intermittent fever which I have had under observation during the past seven years did quinine fail to check the paroxysms. The mode of administration is of little moment, so long as the patient gets a sufficient quantity into his system. In solution or in capsule it is the most efficient. The pills and compressed tablets are more uncertain, as they may not be dissolved. A question of interest is the efficient dose of quinine necessary to cure the disease. I have a number of charts showing that grain doses three times a day will, in many cases, prevent the paroxysm, but not always with the certainty of the larger doses. It is safer to give at least from twenty to thirty grains daily for the first three days and then to continue the remedy in smaller doses for two or three weeks. Other remedies in acute forms of malaria are useless.

In the pernicious forms, and when it is desirable to get the system as rapidly under its influence as possible, the drug should be administered hypodermically (as the bisulphate in thirty-grain doses with five grains of tartaric acid) every two or three hours. For the extreme restlessness in these cases opium is indicated, and cardiac stimulants (such as alcohol and strychnine) are necessary. If in the comatose form the internal tem-

perature is raised, the patient should be put in a bath and douched with cold water.

For malarial anæmia, iron and arsenic are indicated.

XXII. ANTHRAX.

(Malignant Pustule; Splenic Fever; Charbon; Wool-sorter's Disease.)

Definition.—An acute infectious disease caused by the *bacillus anthracis*. It is a wide-spread affection in animals, particularly in sheep and cattle. In man it occurs sporadically or as a result of accidental absorption of the virus.

Etiology.—The infectious agent is a non-motile, rod-shaped organism, the *bacillus anthracis*, which has, by the researches of Pollender, Davaine, Koch, and Pasteur, become the best known perhaps of all pathogenic microbes. The bacillus has a length of from two to ten times the diameter of a red blood-corpuscle; the rods are often united. They multiply by fission with great rapidity and grow with facility on various culture media, extending into long filaments which interlace and produce a dense mycelium. The spore formation is seen with great readiness in these filaments. The bacilli themselves are readily destroyed, but the spores are very resistant, and survive after prolonged immersion in a five-per-cent solution of carbolic acid, and resist for some minutes a temperature of 212° Fahr. They are capable also of resisting gastric digestion. Outside the body the spores are in all probability very durable.

Geographically and zoölogically the disease is the most wide-spread of all infectious disorders. It is much more prevalent in Europe and in Asia than in America. The ravages among the herds of cattle in Russia and Siberia, and among sheep in certain parts of Europe, are not equalled by any other animal plague. In this country the disease is rare. So far as I know it has never prevailed on the ranches in the Northwest, but cases were not infrequent about Montreal.

A protective inoculation with a mitigated virus has been introduced by Pasteur, and has been adopted in certain anthrax regions. Hankin has isolated from the cultures an albumose which renders animals immune against the most intense virus.

In animals the disease is conveyed sometimes by direct inoculation, as by the bites and stings of insects, by feeding on carcasses of animals which have died of the disease, but more commonly by feeding in pastures in which the germs have been preserved. Pasteur believes that the earth-worm plays an important part in bringing to the surface and distributing the bacilli which have been propagated in the buried carcass of an infected animal. Certain fields, or even farms, may thus be infected for an indefinite period of time. It seems probable, however, that if the carcass

is not opened or the blood spilt, spores are not formed in the buried animal.

Animals vary in susceptibility: herbivora in the highest degree, then the omnivora, and lastly the carnivora. The disease does not occur spontaneously in man, but always results from infection, either through the skin, the intestines, or in rare instances through the lungs. The disease is found in persons whose occupations bring them into contact with animals or animal products, as stablemen, shepherds, tanners, butchers, and those who work in wool and hair.

Various forms of the disease have been described, and two chief groups may be recognized: the external anthrax, or malignant pustule, and the internal anthrax, of which there are pulmonary and intestinal forms.

Symptoms.—(1) **External Anthrax.**

(*a*) *Malignant Pustule.*—The inoculation is usually on an exposed surface—the hands, arms, or face. At the site of inoculation there are, within a few hours, itching and uneasiness. Gradually a small papule develops, which becomes vesicular. Inflammatory induration extends around this, and within thirty-six hours, at the site of inoculation there is a dark brownish eschar, at a little distance from which there may be a series of small vesicles. The brawny induration may be extreme. The œdema produces very great swelling of the parts. The inflammation extends along the lymphatics, and the neighboring lymph-glands are swollen and sore. The temperature at first rises rapidly, and the febrile phenomena are marked. Subsequently the fever falls, and in many cases becomes subnormal. Death may take place in from three to five days. In cases which recover the constitutional symptoms are slighter, the eschar gradually sloughs out, and the wound heals. The cases vary much in severity. In the mildest form there may be only slight swelling. At the site of inoculation a papule is formed, which rapidly becomes vesicular and dries into a scab, which separates in the course of a few days.

(*b*) *Malignant Anthrax Œdema.*—This form occurs in the eyelid, and also in the head, hand, and arm, and is characterized by the absence of the papule and vesicle forms, and by the most extensive œdema, which may follow rather than precede the constitutional symptoms. The œdema reaches such a grade of intensity that gangrene results, and may involve a considerable surface. The constitutional symptoms then become extremely grave, and the cases invariably prove fatal.

A feature in both these forms of malignant pustule, to which many writers refer, is the absence of feeling of distress or anxiety on the part of the patient, whose mental condition may be perfectly clear. He may be without any apprehension, even though his condition is very critical.

The *diagnosis* in most instances is readily made from the characters of the lesion and the occupation of the patient. When in doubt, the examination of the fluid from the pustule may show the presence of the anthrax bacilli. Cultures should be made, or a mouse or guinea-pig inocu-