

into sodium nitrate, the final quantity of sodium chloride in solution being only 0.049 gm.

In the bacteriological tests the bismuth subnitrate has been reduced from 1 gm. to 0.001 gm., with no marked diminution in the antiseptic action. Further, when oxygen is eliminated by replacing the air with an atmosphere of CO₂ (any free iodine originally present in the mixture having been removed by washing with fresh medium), the paste has no appreciable antiseptic action. Air subsequently admitted enables it to disinfect as usual.

The mechanical effect of fluids percolating through a film of B.I.P.P. tends to remove the paraffin—there is then a possibility of bismuth disinfection; some of the bismuth subnitrate, which is lighter than iodoform, is also removed. The chief reaction is the continued liberation of small quantities of iodine from a mixture practically insoluble in saline, governed by the oxygen supplied from the air or from arterial blood.

Numerous cultures taken from open wounds under B.I.P.P. treatment have shown, without exception, that the wounds are not bacteriologically sterile, but there is a reduction in the number of bacteria. No change in the flora has been detected. A large number of the wounds are infected with anaerobic organisms, and *B. perfringens*, *B. malignant edema*, *B. Hibler IX.*, and *B. tetani* have been recovered from some of these cases. Although the organisms are present in the wounds they are not able to proliferate freely, and the wounds heal as if surgically clean.

Most of the cases under this treatment excrete to a varying extent products of the decomposition of iodoform, and the general effects of iodide absorption may have some bearing on the results.

CLINICO-ANATOMICAL INVESTIGATION OF A RAPIDLY FATAL CASE OF GENERAL PARALYSIS DUE TO ACQUIRED SYPHILIS.

BY T. E. KNOWLES STANSFIELD, M.B., C.M. EDIN.,

MEDICAL SUPERINTENDENT, LONDON COUNTY ASYLUM, BEXLEY;
HON. FELL., SOC. CLINIQUE DE MÉDECINE MENTALE, PARIS;
HON. CONSULTANT FOR MENTAL DISEASES TO THE
EASTERN COMMAND;

AND

F. W. MOTT, M.D. LOND., F.R.S.,

PATHOLOGIST TO THE LONDON COUNTY COUNCIL ASYLUMS.

THE following case has several striking and unusual features which we think should be recorded. It is that of a young married woman, 26 years of age, who came under care at Bexley Asylum on June 19th, 1916, suffering from general paralysis. Her previous history is as follows:—

She was the tenth child of a family of 11, seven of whom survive her, all said to be healthy and strong. The father died at the age of 59, following an accident sustained two years previously. The mother is alive and well and was the source of our information. The patient was a tall girl for her age, well developed, and had no indications of any congenital disease. She had commenced work as a daily girl at 15 years of age, and was afterwards engaged at a mineral-water manufactory until her marriage at the age of 19. She was "considered a bright, intelligent girl," was "always fond of her home," "never gave her parents any trouble," and was "never given to racing out at night." She kept company with the young man she ultimately married from the age of 17, was married at 19, and gave birth to her first child a week later. The infant was "a fine, big, healthy child," and was suckled by the mother until it was ten months old. The boy is now living, and is a well-developed intelligent boy just seven years of age. His blood was examined by Dr. Mott and was found to give a negative Wassermann.

Two years after her marriage the patient gave birth to a four months foetus. She had a very bad time and took several weeks to recover. Fifteen months later she gave birth to a dead child which was thought to be seven and a half months. During this pregnancy she complained bitterly about pains in her head; she had bad sore-throats very frequently, and her voice became much altered in tone. She became pregnant a fourth time, and expected her confinement at the end of March, 1916. Her mother stated that the patient was out shopping on Saturday evening (March 4th)

with her little son. She called at her house, and when she sat down commenced trying to speak, but her words all ran into each other and her voice became very tremulous, so that what she said was unintelligible. She took her home and the patient partially recovered her speech in about half an hour, though it still remained very tremulous and indistinct. She was not seen by a doctor. She became markedly worse the following Thursday; she had three fits, and was taken to the infirmary. Information obtained from the infirmary was to the effect that she was in a semi-conscious condition; vomiting continuously; incontinent; did not speak unless addressed, and then only with difficulty; and did not sleep well. She was confined of a female child, weighing 5½ lb. and measuring 19½ inches, four days after her admission. No albumin was found in the urine. On March 17th she became melancholic; was still incontinent, but was taking food. She remained in more or less the same condition until June, when she became noisy and inclined to wander. There was nothing remarkable in connexion with the labour, and the child died of infantile atrophy.

For this information we are obliged to the medical officer of the infirmary, and he also stated that there was no good evidence of congenital syphilis.

She was certified insane on June 16th, the medical certificate being as follows:—

That she is restless; does not seem to know people; says she loves me; appears to have hallucinations of sight and hearing; talks to imaginary people; does not appear to have any memory; is dirty in habits. Nurse states that she is noisy and troublesome; that she talks to imaginary people; says her baby is in the next bed to hers, and swears at it; says another patient has stolen her baby; is spiteful to those who came near her; does nothing for herself.

She was admitted to Bexley on June 19th, her physical and mental state then being as follows:—

General bodily condition and nourishment fair. No stigmata of congenital disease. Complexion fresh. Palate: wide arch. Teeth well formed and regular. An abundance of brown, fine hair. Nervous system: motor impairment considerable, partly in consequence of incoördination. Coarse general tremors. Speech tremulous. Coördination of arms impaired; of legs very bad. Station and gait impossible. Tactile sensation could not be tested. Knee-jerks absent. Ankle clonus spurious. Deep reflexes of arms brisk. Brisk flexor plantar reflex. Other superficial reflexes indefinite owing to muscular contractions. Deglutition normal. Sight good. Movement of eyes complete. Pupils: size medium, equal, regular. Mobility to light: right nil; left very slight; to accommodation (r. and l.) fair; consensual (r. and l.) nil. Exophthalmos: nil. Other systems: nothing remarkable.

Mental state on admission. She was confused, quite unable to realise the nature of her surroundings, and could not give any reliable information about herself. All the mental faculties were grossly impaired. Though she chattered a great deal of nonsense about herself, there was no evidence of definite hallucinations or delusions. Most of the time she was unduly elated, hilarious, and self-satisfied, but she readily became lacrymose. She was restless, garrulous, picked at her bedding, and had a trick of stuffing the corner of the sheet into her mouth. She showed a good deal of purposeless resistiveness and muscular rigidity. Was defective in habits and required spoon-feeding.

Her condition was diagnosed as one of general paralysis of the insane; but as we had no definite history with her it became a question, in view of her age and the vague statement accompanying her that she had a family, as to whether she was a case of congenital or acquired syphilis. Her blood and cerebro-spinal fluid were examined at the Pathological Laboratory of the L.C.C. Asylums, Maudsley Hospital, and found to give a very strongly positive Wassermann reaction. On June 26th her condition was noted as follows:—

She is suffering from general paralysis of the insane. She is very demented, happy, contented, and emotional. Her memory is grossly impaired, and she is unable to converse on the simplest topic. In happy, slow, slurred, and hesitating speech, she said: "I love gentlemen." She is fairly nourished.

The disease made very unusually rapid progress, and she died from exhaustion of general paralysis on Sept. 25th. Only a partial autopsy was possible, but we managed to

obtain the brain. Macroscopic examination did not reveal any of the naked-eye appearances of brain syphilis or of G.P.I. The granulation of the floor of the fourth ventricle is the most characteristic and constant naked-eye sign, and it was absent in this case; moreover, the membranes were not thickened. Nevertheless, an emulsion of a small portion of the frontal lobe examined by Dr. Mott microscopically by dark-ground illumination and by Fontana staining method demonstrated the presence of numbers of spirochætes.

We had several interviews with the husband, who stated that he remembered his wife complaining of her hair coming out and of being troubled with sore-throats and headaches, more especially during the period which followed her third pregnancy. We obtained a sample of his blood for examination, as well as that of the boy, the results of which have been mentioned. The husband denied having suffered from any form of disease, and certainly bore no obvious traces. He was emphatic in his protestations against ever having suffered from a sore either of the genitals or elsewhere. Dr. Mott found that his blood gave a positive (+ 40) Wassermann reaction.

The points which occur to us as being worthy of especial notice are:—

1. The extreme rapidity which characterised the progress of the disease, six months and a few days only elapsing between the earliest observed symptoms and death.

2. The naked-eye signs of the disease were not apparent, and, but for the presence of the Wassermann reaction of the cerebro-spinal fluid (during life and post mortem) and the finding of the spirochætes in the brain, it would have been difficult to have come to a decision as to the cause of the mental symptoms manifested during life.

3. The case is of interest in showing the value of the examination of the cerebro-spinal fluid as a means of diagnosis in even the earliest stages of the disease; it is also of interest in the fact that the spirochætes were found in an emulsion of the apparently normal brain by the dark-ground illumination method, after five minutes' search. This conforms with the experience of Levaditi, who showed that spirochætes could be found at the seat of inoculation before the chancre appeared. There was no time for the connective-tissue formation to occur in a sufficient degree to cause naked-eye changes of the brain, but histological investigation of sections of the frontal and central cortex, however, showed the characteristic chronic perivascular inflammation; and by the special silver method spirochætes were found in sections of the inflamed areas. It may be inferred, therefore, that the multiplication of the syphilitic organisms in the brain was the cause of the deviation of the complement by the cerebro-spinal fluid, and that the abundant toxins produced by the rapid growth of the organism were responsible for the perivascular inflammation and neurone degeneration.

4. These histological microscopic changes may be correlated with the characteristic clinical symptoms presented by the case for the comparatively short time prior to the fatal issue. It has been the experience of Dr. Mott to find that the spirochætes are more easily found in these rapidly fatal acute cases, in which macroscopic changes are not evident, or not markedly so. A likely spot for finding the spirochætes may be disclosed by feeling gently the cortex, and if the resistance is less marked an emulsion of that region is advisable, but emulsions of cortex from several soft spots should be made. It may be mentioned here that in 100 successive cases of general paralysis spirochætes were found in 66. In advanced cases where there has been arrest of active symptoms, and death has occurred from some intercurrent disease in the demential stage, the syphilitic organisms are less easily found.

5. Contrary to the original statement of Noguchi, the spirochætes are found in the inflammatory cell infiltration of lymphocytes and plasma cells of the perivascular sheaths, rather than in the cortical brain substance; and this has been my experience in other cases. This being the case, we can understand why the cerebro-spinal fluid gives a positive reaction in the earliest stages of the disease, for the perivascular sheaths form a part of the irrigation system of the cerebro-spinal fluid, which functions in all probability as the lymph of the brain. It is the toxins produced by the spirochætes, and not the organisms themselves, which produce the chronic inflammatory process, for only at certain places can the spirochætes or their

degenerated forms be seen. Consequently the spirochætes at a focus of development, by virtue of the soluble toxins produced, may have a far-reaching irritative effect on the perivascular lymphatic sheaths, leading to widespread congestive stasis and neurone decay. Prior to the decay the toxins contained in the perineuronal spaces may irritate and lead to increased functional activity of the neurones, and the excitement evinced in the early stages of this disease may be thus accounted for by intoxication effects acting more or less on the whole brain, but, as in the case of generalised epileptiform seizures, on the motor cortex especially.

Although there was no naked-eye cortical atrophy, indicative of neuronic decay and destruction and neuroglia-cell proliferation, yet the histological examination showed that both these morbid processes were present over a wide area of the fronto-central cortex.

THE PREVALENCE OF *SPIROCHÆTA EURYGYRATA* IN EUROPEANS AND NATIVES IN THE GOLD COAST.

BY J. W. SCOTT MACFIE, D.Sc., M.B. EDIN.,
PATHOLOGIST, GOLD COAST.

RECENTLY, owing to the return to England of a large number of soldiers suffering from dysentery and diarrhoea, a general interest has been evoked in a number of protozoal organisms which for many years have been familiar to every worker in the tropics. Amongst others the spirochætes found in the intestines have come in for their share of attention, and the commonest species, *Spirochaeta eurygyrata*, has recently been described in detail by Fantham (1916).

In West Africa the occurrence of small spirochætes in the fæces has long been recognised, but the consensus of opinion has been that they were not pathogenic. Under abnormal conditions, in cases of dysentery or diarrhoea, however, they were known sometimes to occur in myriads, and it was believed they might in these circumstances be a subsidiary cause of illness. In view of the revived interest in these organisms a brief note on their prevalence in Europeans and natives in the Gold Coast Colony may not be inappropriate.

Materials Examined.

Previous experience had proved that the spirochætes were most readily found in the fæces after purgation, and for this reason most of the specimens examined were taken from patients to whom a saline aperient had been administered for simple constipation, as a preliminary to surgical treatment, or for the purpose of ascertaining if helminth infections were present; but in addition the fluid or semi-solid motions from cases of dysentery and diarrhoea were searched as well as some normal stools. The specimens were examined both fresh and after fixation and staining. Leishman's stain and gentian violet were used; the latter when drawings were to be made for the purpose of measuring the length of the organisms, and the former when the structure of the cytoplasm was to be studied.

Flagellates, *Trichomonas*, &c., are also very commonly met with in fæces in the Gold Coast and had to be remembered, as their flagella, which they are apt to lose, sometimes simulate spirochætes. This fallacy, although it had to be kept in mind, was not found to be a serious difficulty in practice. The (?) sprouting vegetable cells, so troublesome in many animals, are, fortunately, absent from men.

In this manner a large number of Europeans and natives and a few Syrians have been examined since February, 1916, and in every case spirochætes have been present. I have not failed so far to discover them in a single individual examined for these organisms at Accra. In the Europeans they were generally relatively scarce, but in many of the natives and some Europeans they were abundant. Cases of amoebic dysentery were not, as a rule, exceptionally heavily infected, but in some patients suffering from diarrhoea they were so numerous that it was difficult to believe that they could have been entirely harmless.

The last 20 cases examined, which included 5 Europeans, 14 natives, and 1 Syrian, may be taken as a typical sample. In the Europeans the spirochætes were scanty in 4 and abundant in 1, the latter individual being a healthy man.