The organisms are very resistant to staining, being uncoloured by Leishman, Romanowsky, or Giemsa's stains, and requiring a mordant method, but may be demonstrated by Indian ink methods.

They occur in the urine, often abundantly, during and immediately after the rise of temperature, but in the intervals may be so scarce as to be practically absent.

Like McNee³ and others, I have been unable to find any organism by direct examination of the blood of these patients, and I have not had an opportunity of determining *post mortem* at what part of the urinary tract the spirochaetes originate.

Results.

The following are the cases in which I have found spirochaetes in the urine:

Trench nephritis...	...	3 cases.
Pyelonephritis, with abscesses of lungs	...	1 case.
Relapsing P.U.O....	...	15 cases.
Myalgia following P.U.O.	...	1 case.
N.Y.D. appendicitis	...	5 cases.

Whether in these different cases we are dealing with the same spirochaete I am unable to state at present.

Clinical Aspect.

These observations suggest that we may be able to bring into line at least two clinical types of "P.U.O." (pyrexia of unknown origin).

1. A disease with acute onset with chills and vomiting, pain in the abdomen, usually more marked in the right upper quadrant, with continued fever for several days, often with enlargement of the spleen and herpes of the lips. The pulse-rate is not increased, and is usually slowed to 50 or 60 beats a minute in convalescence. There is a leucocytosis of 12,000 to 25,000 with relative increase in the large mononuclears. The cases, if an attempt is made at diagnosis, come to the base as "?appendicitis," or "N.Y.D. abdominal"—the initials "N.Y.D." standing for "not yet diagnosed." I recognize that these are the cases which presented nothing but abnormal temperature, malaise, and slow pulse, and were evacuated to England. In three such cases last year I remember a note coming from Captain Stokes⁴ to the effect that the guinea-pigs into which the blood of the patients had been injected had died on the ninth or tenth day with signs of spirochaetosis. In his published cases he notes that the urines of the patients were examined with negative results. In these cases I now find spirochaetes almost constantly in the urine. French authors have suggested that cases of icterohaemorrhagic spirochaetosis may have almost their whole incidence upon the kidney, and so one finds spirochaetes in cases which cannot be distinguished from acute (trench) nephritis, except perhaps by the long continuance of much albumin and kidney debris in the urine.

2. The relapsing type of P.U.O. (trench fever) with the characteristic periodic rises of temperature, myalgic and periosteal pains, and leucocytosis with or without enlargement of the spleen, in which an improving technique has enabled me more and more frequently to find a spirochaete in the urine during and immediately after the exacerbations of temperature.

I wish to thank Lieut.-Colonel C. J. Martin, A.A.M.C., for his advice and interest in this work, which is being continued.

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¹ Renaux and Wilmaers, *Paris méd.*, March 3rd, 1917, p. 196. ² Garnier and Reilly, *Ibid.*, March 3rd, 1917, p. 176. ³ McNee and Renshaw, *BRITISH MEDICAL JOURNAL*, February 12th, 1916, p. 225. ⁴ Stokes and Ryle, *Ibid.*, September 23rd, 1916, p. 413.

A FEAST of flowers is held annually in various cities in Spain for the purpose of raising funds for the campaign against tuberculosis. This year the sum of £5,640 was collected in this way in Madrid.

ACCORDING to official statistics recently published, the birth and death rates in Sweden during 1916 were the lowest ever recorded for that country. The birth-rate was 21.14 and the death-rate 13.55 per 1,000.

THE late Privy Councillor Dr. Albert Neisser, Professor of Skin Diseases and Syphilis in the University of Breslau, left his estate, valued at nearly £80,000, to the city of Breslau. He directed that his villa with its collections should be maintained as a museum for contemporary works of art, and that the rooms should be used by the municipality for high class concerts.

ACUTE SYPHILITIC MENINGITIS.

BY

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THE invasion of the central nervous system by the organism and toxin of syphilis leads to pathological changes curiously diverse in their clinical manifestations. To take the cord only, they may range topographically from the lightning pains of a dorsal root ganglion infection, the ataxia of a dorsal column atrophy, the spastic paraplegia of a lateral sclerosis, to the pure amyotrophy of involvement of the ventral cornua. Again, from the standpoint of the time factor, they may include on the one hand an absolutely acute meningitis within a few weeks or months of infection, or on the other a chronic parenchymatous degeneration years, sometimes many years, after the original invasion.

The fact that the majority of syphilitic nervous affections are generally conceived of as running a semichronic if not actually chronic course may have thrown somewhat into the background the idea of a syphilitic infection of the meninges as acute, as abrupt, and as serious as that of any other toxi-infective condition. It is no doubt better recognized than formerly that meningeal irritation is of common occurrence in the secondary period of syphilis in the shape of rachialgia, paraesthesiae in the limbs, muscular tiredness and weakness, and increased activity of the cutaneous and deep reflexes, possibly also some slight irritability of the bladder. There may also, however, develop an actual acute meningitis, a clinical entity due appreciation of which is of prime importance from a therapeutic point of view. So well established may be the usual symptoms and signs of acute meningitis that its distinction from acute tuberculous or acute cerebro-spinal meningitis becomes a matter of considerable clinical and pathological interest.

Acute syphilitic meningitis may be regarded as appearing under three phases or at three periods in the course of syphilis.

1. It may occur as an acute exacerbation in cases of congenital syphilis.

2. It may develop during the secondary period, either with or very soon after the cutaneous exanthem, or even at a prorseolar stage.

3. It may be an episode in the tertiary stage, arising in the course of a chronic gummatous syphilis, long after infection, and sometimes when the lesions in the nervous system have appeared to be latent or quiescent.

In the first and third of these the meningeal syndrome occurs along with other symptoms or signs of syphilis, whereas in the second the clinician may be faced with the picture of an acute meningitis *per se*, and he must depend for his diagnosis on the history, or an examination of the cerebro-spinal fluid, or on certain variations in the clinical symptom-complex.

The purpose of this communication is to direct attention to the occurrence shortly after infection of this acute syphilitic meningitis by itself, as an acute fever, and to describe a striking instance which has come under our observation, in which differential diagnosis presented problems of some practical importance, and in which a complete cure resulted by means of intraspinal injections of mercurialized serum.

Hitherto most of the work that has been done on this subject we owe to the French school of neurology.

Boidin and Weill¹ have recorded the case of a youth aged 18 who developed a chancre in the middle of June; on July 15th he began to suffer from headache, and by August 5th an acute meningitis made its appearance, with headache, vomiting, rigidity of the neck, Kernig's sign, slight rise of temperature, and the attitude *en chien de fusil*. Only seven days later, on August 12th, did the roseolar eruption make its appearance. Recovery followed under treatment.

Laubry and Giroux² have published the case of a young woman of 24, with no history of syphilis, who suddenly developed violent headache, tinnitus, nausea and vomiting,

This was followed by contracture of the neck and trunk muscles, and diplopia. Kernig's sign was present. The spinal fluid on lumbar puncture showed a marked lymphocytosis, and under injections of mercury recovery ensued.

Ballet and Barbé's³ case was that of a female aged 21, who developed severe headaches, stiffness in the neck and mild delirium while the roseola was still present. Kernig's sign was obtained. In the spinal fluid was an enormous lymphocytosis. With three months' steady treatment improvement set in, but a subsequent relapse ended fatally. Generalized syphilitic meningitis was found at the *post-mortem* examination.

In a case recorded by Audry and Lavau⁴ the patient was a man of 25, in whom a chancre had appeared one month previously. There was a sudden onset of violent headache and vomiting, with neck rigidity and Kernig's sign. In the spinal fluid was a pronounced lymphocytosis. The symptoms subsided in a fortnight.

Achard and Desbouis's⁵ case concerned a female of 20, who two months previously had developed a vulvar chancre. This was only discovered subsequently, for the first symptoms were those of acute meningitis, diagnosed as tuberculous; lumbar puncture, however, and a more careful history, revealed the true nature of the condition, which rapidly improved under injections of mercury binioidide.

In a different group is the case reported by Jeanselme,⁶ where a female of 22, who had had syphilis three years previously, suddenly developed all the symptoms of acute meningitis, with violent headaches, delirium, generalized rigidity, strabismus, and the presence of Kernig's sign. The spinal fluid was remarkable for an enormous lymphocytosis. In spite of urgent antisyphilitic treatment, death followed.

Apart from such fulminant cases a large number have been reported where the symptoms of meningitis, though unmistakable, were not so severe or so widespread. Thus Ellis⁷ has published six cases of meningeal involvement from one to four months after the chancre. Similarly Lavau⁸ has reported nine cases of metachancral and pre-roseolar meningitis in syphilis, but in some at least of these the symptoms were less subjective than objective. As we are concerned only with such cases as are liable to be confused with fully-developed acute meningitis of other origin, these incomplete examples need not be further alluded to.

As instances of the unexpected appearance of acute meningitis in congenital syphilis there is the case observed by Ravaut and Darré,⁹ and in the course of chronic syphilis those of Claisse and Joltrain,¹⁰ Oettinger and Hamel,¹¹ de Coux,¹² and others.

It is perhaps too much to expect, with Bronstein,¹³ that the term acute syphilitic meningitis should be reserved for cases occurring during the secondaries, either before, during, or soon after the cutaneous eruption, but were this to be done it would bring the condition more into line with the more familiar varieties of acute meningitis.

The case that has come under our own observation is that of a patient in Fulham Military Hospital, and we desire here to record our indebtedness to Captain Carnegie Dickson, R.A.M.C., the pathologist to the hospital, for his examinations of the spinal fluid.

A. B., aged 24, was sent into Fulham Military Hospital on November 11th, 1916, by Captain Flack, bacteriologist to the London district, as a case of cerebro-spinal fever. He had complained of increasing headaches, pains in the neck, and nausea, and there was a history of syphilis some months previously. On the same afternoon Captain Flack made a lumbar puncture; clear fluid was withdrawn under pressure; films showed excess of lymphocytes and a few polymorphs, but no cocci.

On examination the next day the patient was found to be quite rational and the temperature was normal. He showed, however, all the typical symptoms of acute meningitis, intense headache, nausea, rigidity of the neck; Kernig's sign was present, and a *tache cérébrale*. It was noted that the pupils were small and unequal, but they reacted to light; the cutaneous reflexes were active, the deep neither increased nor diminished.

On the same day (November 12th) 90 c.cm. fluid was withdrawn under considerable pressure and 27 c.cm. antimeningococcal serum administered. Captain Dickson reported as follows: "A predominantly polymorphonuclear exudate with a moderate number of mononuclears, chiefly medium and small. . . . A very few degenerated 'granules,' probably cocci, but not definite. From the cytology, almost certainly cerebro-spinal meningitis."

For the next five days the patient was treated daily by lumbar puncture and antimeningococcal serum. Meanwhile it was

clear to one of us (A. C. E. G.), under whose care the patient was, that the clinical course of the case was different in several respects from the usual course of cerebro-spinal meningitis; in particular—

1. There was no pyrexia.
2. The mental condition was unusual. The cerebro-spinal fever patient is actively complaining or noisily delirious, whereas this patient was depressed and quiet.
3. The tongue was almost clean, whereas the mouth in the average cerebro-spinal fever case is characteristically foul.
4. There was no sphincter trouble and until later no vomiting.
5. There was little or no definite progress in either direction, whereas the average case of the other condition would have been getting much worse after a week or responding steadily to treatment.
6. The naked eye character of the cerebro-spinal fluid was unusual, as it was much clearer by the fourth day than could be expected except in a mild case of rapidly recovering cerebro-spinal fever.

Further, the cytology of the fluid had changed. On the fourth day it was reported that the mononuclears, chiefly small, greatly outnumbered the polymorphs; on the next day the two varieties were present in about equal numbers; at the end of the first week the lymphocytes were definitely in a considerable majority. A thick film stained for tubercle bacilli proved completely negative. No meningococci were discovered at any time.

In view of these important data the exact diagnosis was still not clear, and on November 18th one of us (S. A. K. W.) saw the patient in consultation.

On that date there was slight but definite papilloedema of both optic discs, the pupils were small and unequal, and their reaction to light was not brisk, the tendon reflexes were active, and the plantar response flexor. The other signs of acute meningitis remained as before. A diagnosis of acute syphilitic meningitis was then made, and a Wassermann test in the fluid was regarded as imperative. This was done the next day at Rochester Row, and to our surprise the result was reported as negative.

For the next ten days the patient's condition varied but little. He still complained of splitting headaches, was occasionally sick, and looked very ill. He lay in bed indifferent to his surroundings, was irresponsive, depressed, almost sullen, and only occasionally irritable when roused. The meningeal symptoms and signs remained as before.

In view of our increasing conviction of the syphilitic nature of the case, notwithstanding the negative Wassermann on November 19th, we determined to have the test repeated on December 1st, both in the blood and the fluid, which was done. Captain Carnegie Dickson reported a strongly positive Wassermann in both. Direct antisyphilitic treatment was at once commenced. On December 2nd 80 c.cm. of clear fluid were withdrawn by lumbar puncture, and 30 c.cm. of Mulford's mercurialized serum, containing the equivalent of $\frac{1}{8}$ gr. Hg, were injected intrathecally.

On the following day the patient was if anything more ill, was mildly delirious with an occasional meningeal cry; there was marked paresis of the left external rectus; ankle clonus and an extensor response were present on the right side. The right optic disc showed 5 D. of swelling, the left 4 D. Mercurial inunction was commenced in addition to the intrathecal method.

From that time, however, the case unmistakably began to change for the better. The mercurialized serum injections were continued at intervals of approximately a fortnight, and six in all were given, the last on February 16th, 1917. The Wassermann test in the fluid, and the cell and globulin tests were by that date completely negative. Corresponding to this improvement was a steady amelioration in the clinical symptoms. By the beginning of January practically the only signs in the nervous system were diplopia and slight paresis of the left external rectus, as already noted; the subjective symptoms had all but disappeared. By the beginning of February the optic discs showed no trace of the previous neuritis, while the diplopia and rectus paresis had vanished.

On February 22nd the mercurial inunction was stopped, and on March 5th the patient was discharged from hospital cured.

Before he left an accurate account of the onset of his symptoms was obtained from the patient himself, and this may be summarized in a few words. He contracted syphilis on or about August 10th, 1916, and though the signs were minimal, a Wassermann blood test was positive on August 15th. Some seven intravenous injections of kharsivan were administered, and a number of intramuscular injections of mercury, and by the end of September the Wassermann test in the blood was negative, and the patient felt perfectly well. At the end of October or beginning of November he noticed slight headache over the left eyebrow, which he associated with the strenuous clerical work he was then undertaking. In the course of one week this headache became persistent and severe. On November 8th a blood test was made, but we have not been able to trace the result. On November 10th the headache became unbearable, and that night he was kept awake by agonizing pains in the back of the neck, shooting up and into the left ear. On the 11th he was unable to get up; he felt very sick but did not vomit, and in the afternoon he was admitted to Fulham Military Hospital as above.

To summarize the salient features of this case: A previously healthy young man of 24 contracts syphilis and is

treated systematically without delay by accepted methods. The Wassermann reaction is positive in the blood; apparently no secondaries develop. In less than two months the reaction is negative, and the patient feels perfectly well. Almost exactly three months after infection he suddenly begins to suffer from severe headaches, and in the course of a few days develops the characteristic symptoms of acute meningitis. The case is diagnosed as cerebro-spinal meningitis, and is treated for a week with antimeningococcal serum in full doses. Doubts are cast on the diagnosis by the course the disease pursues and by the cytological findings in the fluid, as well as by a consideration of the history of the case. On the eighth day after admission syphilitic meningitis is diagnosed and the fluid subjected to the Wassermann test, which is, however, reported as negative. A fortnight later both in blood and fluid the Wassermann test is found to be strongly positive, and by energetic treatment with mercurialized serum and mercurial inunction the patient makes uninterrupted progress to complete recovery. He is discharged cured not quite four months after admission.

A case of this description presents several features of interest.

1. On clinical grounds a suspicion of the inaccuracy of the original diagnosis was not long in crossing our minds. There was not at any time any pyrexia; there was no vomiting till quite late in the course of the case; sphincter troubles were conspicuously absent; no rash was observed. Further, in the average case of cerebro-spinal fever the patient either sinks into coma with comparative rapidity, or becomes quickly cheerful as he improves; in other words, by the close of the first week there is usually adequate indication of the course the case is going to take. Yet in ours the patient remained for some weeks practically in the same state as on admission. He had neither restlessness nor delirium, except for a few hours at a late stage, and was perfectly rational throughout. Where cerebro-spinal meningitis becomes chronic the meningeal signs—retraction, rigidity, etc.—are as a rule very marked; emaciation is pronounced and incontinence of common occurrence. None of these phenomena was present in our case.

It may be regarded as certain, then, that the clinical aspect of the case was from the outset felt to be anomalous for cerebro-spinal meningitis.

There is a conflict of opinion as to the possibility of differentiating acute syphilitic meningitis clinically from other varieties. Desnos¹⁴ thinks it is not to be distinguished; Bronstein says the ordinary meningeal symptoms are less developed and less marked; little change in pulse or respiration occurs; the evolution is irregular, with exacerbations and remissions. De Coudé declares the symptoms are those of an ordinary diffuse meningitis, resembling tuberculous meningitis. We have already commented on the features of the case here recorded, which in our opinion separate it clinically both from cerebro-spinal and tuberculous meningitis; whether these are pathognomonic or not, whether they are exceptional in acute syphilitic meningitis or not, whether they were conceivably modified or not by the first week's treatment with antimeningococcal serum, we are not able to determine.

2. The findings in the fluid call next for remark. In none of the many examinations were cocci ever found; on the first occasion there was an unmistakable excess of lymphocytes, with a few "polymorphs." It has been shown that thereafter the fluid varied, becoming predominantly polymorphonuclear, and later again markedly mononuclear. In this connexion it is of interest to note that in Claisse and Joltrain's case the fluid was at first typically lymphocytic, after two intraspinal injections of colloidal mercury it became polymorphonuclear, and subsequently lymphocytic again. The question thus arises whether the injections of antimeningococcal serum exercised a modifying influence on the cytological content of the fluid, notwithstanding their non-specific action in this case. It is our opinion that the polymorphonuclear character of the exudate was due to the administration of antimeningococcal serum, as in our experience every case in which, owing to the suspicion of cerebro-spinal fever, this serum has been administered, has shown this polymorph reaction even when the suspicion has subsequently proved to be groundless.

The lymphocytosis is not of itself different from what is

found in the tuberculous variety. De Coudé holds that in cases where the acute form of syphilitic meningitis occurs as an exacerbation from the chronic invasion of syphilis a lymphocytic finding may change to polymorphonuclear. Di Porto¹⁵ says the fibrin reticulum constantly found in tuberculous meningitis is not got in the acute syphilitic type, but we have no information on this point.

When the Wassermann test was first done in the fluid on November 19th, the result was negative; a fortnight later it was strongly positive. The sole comment we feel justified in making is that owing to unavoidable exigencies the examinations were made by different pathologists.

As far as treatment is concerned we desire to record the satisfactory results of the use of Mulford's mercurialized serum by the intraspinal route.

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THE TREATMENT OF WOUNDS INFECTED WITH *BACILLUS PYOCYANEUS*.

BY

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AND

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INFECTION of wounds by the *Bacillus pyocyaneus* is comparatively common. Sometimes the patients arrive with the wounds already infected; on the other hand, the infection often develops some time after admission. Infection may be from some previously infected wound, or it may arise from the use of infected instruments or apparatus, especially arm baths. There is also reason to suspect that some wounds are already infected with this bacillus, but owing to the presence of other organisms its growth is impeded and the characteristic appearances of the pus are not present until the local conditions of the wound become favourable for its free growth. The virulence of the organism appears to vary considerably.

Characters of an Infected Wound and Condition of Patient.

1. The suppuration is profuse, and it has a characteristic bluish-green colour which varies considerably in shade, and which stains the dressings and also very often the patient's skin.
 2. There is a characteristic offensive, musty odour.
 3. When this infection appears it tends to extend to other wounds in the same ward, although careful precautions are taken.
 4. When it has once appeared in a wound it is very difficult to eradicate, and the healing of the wound is often greatly impeded.
 5. There may be an intractable diarrhoea due to infection of the intestinal tract, presumably of septicæmic origin, and in one case recently *B. pyocyaneus* has been isolated from the blood.
 6. As a result of the prolonged suppuration there may be considerable weakness and anaemia.
- Owing to the above facts wounds infected with this organism have been in some hospitals isolated and treated in separate wards. The infection is not dangerous to life, and as a rule eventually the cases do well. Indeed it would appear in most cases that the wound must be granulating and showing signs of repair before the organism can grow sufficiently freely to produce the characteristic pus. Many cases in which routine bacteriological examination of pus shows *B. pyocyaneus* without clinical signs of infection have later quite suddenly discharged pus of characteristic colour and odour. Hence the infection frequently appears in wounds that are regarded