cent. of the cases. If spirochaetes of the *refringens* type are included, the incidence rises to 44 per cent.

The spirochaetes occurred in about 1 in 2½ men sick of miscellaneous medical and surgical conditions, and in 1 in 5 of healthy men. This difference is probably to be ascribed to differences in hygiene, and to the variations in amount of flora of mucous surfaces familiar in other regions, in conditions of varying vigour.

The variety of organisms makes it improbable that the mere finding of spirochaetes in the urine can have any diagnostic value in relation to the relapsing fevers until definite morphological or other differences are established between the various normal and pathogenic varieties.

TABLE I.—Incidence of Spirochaetes in 50 Hospital Patients.

	In Urethra.	In Urethra or near Orifice.
	Per cent.	Per cent.
Spirochaetes (excluding <i>S. refringens</i>)...	46	52
Spirochaetes (including <i>S. refringens</i>)...	56	62
Spirochaetes (<i>refringens</i> type only) ...	6	10

TABLE II.—Incidence of Spirochaetes in 50 U.S.A. Men.

	In Urethra.	In Urethra or near Orifice.
	Per cent.	Per cent.
Spirochaetes (excluding <i>S. refringens</i>)...	20	24
Spirochaetes (including <i>S. refringens</i>)...	22	32
Spirochaetes (<i>refringens</i> type only) ...	2	6

TABLE III.—Incidence of Spirochaetes in the Whole Series of 100 Men.

	In Urethra.	In Urethra or near Orifice.
	Per cent.	Per cent.
Spirochaetes (excluding <i>S. refringens</i>)...	33	38
Spirochaetes (including <i>S. refringens</i>)...	44	48
Spirochaetes (<i>refringens</i> type only) ...	11	10

I wish to express my thanks to Lieut.-Colonel R. U. Patterson, M.C., U.S.A., for his aid in enabling me to get a complete series, and to Major R. I. Lee, M.O.R.C., U.S.A., for his suggestions.

SPIROCHAETES OCCURRING IN THE URINE OF CASES OF "PYREXIA OF UNKNOWN ORIGIN."

(Preliminary Note.)

By S. W. PATTERSON, M.D., MAJOR R.A.M.C.(T.C.),
BEIT MEMORIAL RESEARCH FELLOW.

DURING the past few months I have examined the urine of cases of P.U.O. (pyrexia of unknown origin) for spirochaetes, using a modification of Renaux and Wilmaers's technique.¹ The results are so suggestive that I venture in this preliminary note to call attention to the necessity for a systematic examination of the urine in certain clinical types of P.U.O. which may ultimately turn out to have a common etiological origin.

Since in March, 1917, Garnier and Reilly² suggested that in certain cases of icterohaemorrhagic spirochaetosis the chief incidence of the disease may be upon the kidney, I have examined a number of cases of trench nephritis and found a spirochaete in a fairly large proportion. Further, in what I regard as a definite clinical type of P.U.O. (appendicular, or abdominal—described below), which is probably a mild form of icterohaemorrhagic spirochaetosis, I have found a spirochaete almost constantly present in the urine. Again, in the relapsing type of P.U.O. (trench fever) a spirochaete can frequently be found in the urine during and immediately after the exacerbations of temperature.

Methods.

The method I have been using is as follows:

At first the specimens of urine were obtained in the ordinary way, and brought to the laboratory in clean

bottles; but later precautions were taken to try to avoid contamination of the samples. After drawing back the foreskin, the prepuce and meatus were swabbed with a 1 in 1,000 mercury perchloride solution; the patient then passed urine, and a sample towards the end of the act of micturition was caught in a large sterile test-tube. The urine was centrifuged and at first, after pouring off the supernatant fluid, the deposit was washed with sterile water and recentrifuged. Control experiments showed, however, that the spirochaetes seemed to be of comparatively low specific gravity, requiring, therefore, prolonged centrifuging (ten minutes at least, and the longer the spinning is kept up the greater the number found), and care not to remove the lowest layer of supernatant urine before recentrifuging. So it was easier, once one learnt the morphology of the organism, to pick it out in greater quantity even amongst a certain amount of debris, rather than to hunt for isolated spirochaetes on a comparatively clean slide; and the deposit was not washed.

Dark-ground illumination not being available, the following methods of dealing with the deposit were adopted:

1. Indian Ink.

Some of the deposit was mixed intimately with a drop of "Chin-Chin" liquid pearl ink (Watson) on a clean slide, and a film made by drawing along the slide a small piece of cigarette paper wetted in the drop. The film so made soon dried and could be examined directly with the oil-immersion lens. Spirochaetes, if numerous, showed up readily by this method, but the debris of the urinary deposit sometimes caused confusion and difficulty. This method, however, probably shows the spirochaetes in a more natural condition than when mordants and dyes are used.

I. Spirochaetes of Type 1, abdominal P.U.O.
II. Type 2, relapsing P.U.O.
III. Spirillar form from urethra.

2. Tannic Acid and Carbol-Fuchsin (Renaux and A. Wilmaers).

Films are made of the deposit and fixed for ten minutes in absolute alcohol; then covered with 5 per cent. tannic acid solution and warmed till steaming; then well washed with distilled water, and, without drying, stained with carbol-fuchsin, steaming for half a minute, washed, dried, and examined. This is a very simple and rapid method, but does not give such a clear-cut picture as silver nitrate.

3. Tannic Acid and Silver Nitrate (Fontana).

The films are fixed with repeated washes of fixing fluid (acetic acid 1 c.cm., formalin 20 c.cm., aq. dest. 100 c.cm.), then washed well with distilled water; flooded with mordant (tannic acid 5 grams in 100 c.cm. carbolic acid solution 1 per cent.) and warmed for thirty seconds; then well washed with changes of warm distilled water, flooded with 1 per cent. silver nitrate, and warmed gently for half a minute, washed and mounted in balsam.

Spirochaetes.

The spirochaetes have the following characters:

They are about one to one and a half times the diameter of a red blood corpuscle, and are very thin, the ends tapering.

They show five to eight more or less regular turns, and may be straight, bowed, or lying in a semicircle.

The spirals are not so fine as in *Spirochaeta pallida*, nor so coarse as in the spirochaete of Obermeier.

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.

REFERENCES.

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,