SPIROCHAETA PALLIDA :

METHODS OF EXAMINATION AND DETECTION,
ESPECIALLY BY MEANS OF THE DARK-
GROUND ILLUMINATION.

By ALFRED C. COLES, M.D., D.Sc., F.R.S.Ed.,
M.R.C.P.LOND.,
BOURNEMOUTH.

Now that it is very generally conceded that the *Spirochaeta pallida* is the cause of syphilis, its recognition, especially in the early stages of the disease, is a matter of considerable diagnostic importance.

I have endeavoured to describe briefly the method of taking the material for examination, the most approved methods of staining, and the method of examining the living organism by means of the dark-ground illumination.

I. TAKING THE MATERIAL.

Although the *Spirochaeta pallida* has been found in almost all forms and stages of syphilis, including even the gumma, the most usually selected lesions for examination purposes are:

- (a) The primary sore, either in its unbroken or papular stage or in the usual form, the ulcerative chancre.
- (b) Condylomata and mucous patches, which are so highly infectious, and in which the spirochaetes occur probably in the largest number.
- (c) The indurated glands.
- (d) The various forms of eruptive lesions, especially the papular and vesicular forms, more rarely in the roseola.

From the Primary Papule.

The surface of an unbroken papule should be thoroughly cleansed, and then gently rubbed or scratched with a scalpel. After a few seconds an exudation of a clear or slightly blood-stained fluid appears. Films or cover-glass preparations are made from this. The more blood present in this serous exudation the more difficult will it be to recognize the specific organism, and in those cases in which the rubbing has produced bleeding, it is well to remove the blood, and wait till the bleeding has ceased, before attempting to take the serum.

In the case of the ordinary specific ulcer it is important to realize that the spirochaetes are found in the deeper parts of the wound, and that the superficial layer consists of all kinds of bacteria, and contains the *Spirochaeta refringens* in large numbers, but very few of the *Spirochaeta pallida*. In a preparation made from the surface secretion of a sore, very great difficulty will be experienced in finding *Spirochaeta pallida* and also in distinguishing other non-pathogenic spirochaetes, which are present there in large numbers, from the genuine spirochaete, which may have undergone some degenerative changes. The non-success of many bacteriologists, in the early days after Schaudinn's discovery, was due very largely to the improper taking of the material.

The surface of a chancre should be thoroughly cleansed with water or saline solution, and then rather firmly rubbed with a little cotton-wool or gently scraped with a knife, needle, or sharp spoon, avoiding bleeding. The few drops of blood which first appear should be removed, and then, after waiting a few seconds, a quantity of clear or slightly blood-stained serum exudes. This may be somewhat encouraged by gently massaging the sclerosis. Films should then be made from this serum, either on slides or cover-glasses which have been very thoroughly cleaned. The slides should be slightly warmed first, so that the almost invisible film dries at once. Schaudinn found that, by exposing the slides to fumes of osmic acid for a few seconds before and after spreading the film, the spirochaetes were killed and fixed in a somewhat more natural position. Too long exposure of the still moist film to osmic fumes diminishes the staining properties.

Cover-glass preparations of the serum for the examination of the living organisms should be made on very thin and clean slides. Films made from the serum, "Reiz-serum, or serum of irritation," as Hoffmann terms it, generally contain large numbers of *Spirochaeta pallida*, few red blood corpuscles, and very little or no cellular

débris. There may be a little difficulty in focussing such thin films, but the presence of a few red corpuscles assists, and in stained preparations the spirochaetes, if present, are easily found. According to Hoffmann, films made from scrapings (*Geshabe*) contain the largest number of spirochaetes.

Some workers excise a small piece of the tissue, and rub this up with a little distilled water, and make films and cover-glass preparations from a drop of this fluid.

Condylomata and Mucous Patches.

Material suitable for examination is obtained in much the same way as from the primary sore. The serum which exudes after rubbing and scraping the surface of a chancre or condyloma may be collected in capillary tubes or blood capsules, the ends being subsequently sealed in the flame. Films and fresh cover-glass preparations may be made from this afterwards.

The Indurated Glands.

The *Spirochaeta pallida* may also be found in the nearest lymphatic glands, commonly those of the groin when the primary sore is situated on the genital organs.

Preiss,¹ who has been able to demonstrate the *Spirochaeta pallida* in nearly 100 per cent. of cases of syphilis in the secondary stage, says that gland-puncture should be used in all cases in which the examination of the serum from an ulcer proves negative. This is likely to be the case if the ulcer is partially or completely healed, if it has been treated with caustics, or if it is disintegrated. He has never failed to find the specific organism during the period between the first typical hardening of the glands and the first eruption—six to ten weeks.

The skin over the gland is washed with an antiseptic, shaved, and then rubbed with ether. A syringe with a needle a little larger than that of an ordinary hypodermic is plunged obliquely into the long axis of the gland, which is firmly fixed with the left hand. That the needle is actually in the gland can be ascertained by moving it about, when the gland will simultaneously be felt to move. Whilst the piston is being withdrawn, the whole gland is massaged or squeezed with the left hand. In this way a few drops, probably only enough to fill the needle, are withdrawn. Cover-glass and film preparations are then made from this blood-stained fluid, and examined in the fresh and stained condition.

Syphilitic Eruptions.

The roseola presents the greatest difficulty. Mere pricking the spot and examining the blood affords very little chance of finding the organism. It is much better to scrape the surface gently, and, avoiding bleeding as much as possible, obtain a little clear or blood-stained lymph. Rosenberger, in order to avoid bleeding, pinches up the skin in a pair of forceps until it is pale, and then incises, and aspirates one or two drops of serum. Sometimes blisters are applied over the surface, and the contents of the resulting bulla examined.

In vesicular or pustular forms of eruption the serum or pus is aspirated in capillary tubes or films made directly from the fluid. Better results are, however, obtained by opening the vesicle, removing the contents, and gently scraping the base of the exposed lesion.

II. METHOD OF EXAMINING THE MATERIAL.

The material containing the *Spirochaeta pallida* may be examined by means of dry-stained films or in the living condition in cover-glass preparations.

Staining.

Films may be made either on cover-glasses or on slides, but owing to the nature of the staining reagents they must be scrupulously clean. It has been very generally believed that the *Spirochaeta pallida* was a very difficult organism to stain, that it required special stains, and that the staining process should be extended over a long period. Many of the early failures were attributed to the staining, whereas in some cases, at least, it was the method of taking the material which accounted for the absence of the organisms. It is now known that the spirochaete can be stained by many of the ordinary aniline dyes besides Giemsa's modification of Romanowsky's stain. A. Ehrlich

and Lenartowitz² find that the *Spirochaeta pallida* stains in:

Ziehl-Neelsen and carbol-gentian-violet, in from half a minute to two minutes.

Carbol-methylene blue and carbol-dahlia, in from five to ten minutes.

Loeffler's methylene-blue and carbol-thionin, in from twenty-five to thirty minutes.

In saturated aqueous solution of Bismark brown and vesuvin and safranin, in one hour or more.

At the present time Giemsa's stain or some other modification of the Romanowsky stain is almost universally used, partly because it stains the organism better than most others, and partly because it imparts to the *Spirochaeta pallida* a more or less distinctive, but by no means absolutely characteristic, tint. Almost all the other spirochaetes are stained bluish with this stain, whilst the *Spirochaeta pallida* takes a reddish colour.

I have experimented with most of the stains recommended from time to time, especially Giemsa's, Leishman's, and Wright's, and find that all to some extent, depending on the duration of the staining and probably the cleanliness of the slides, tend either to cause a granular deposit, or stain the background of the preparation. Preferably I use Giemsa's or Leishman's stain, and on the whole I am inclined to agree with Leishman, who finds that his stain whilst staining the organisms well does not give as much deposit as the first named.

Leishman's Stain.

This can be bought ready prepared, or can be made by rubbing up in a mortar 0.15 gram of the powder with 100 c.cm. of Merck's analytically pure methylic alcohol. Burroughs Wellcome have placed on the market a soloid of Leishman's stain which gives excellent results. This stain can be used in two ways:

1. A few drops of the stain is poured over the air-dried film and allowed to act for about thirty seconds. At the end of that time double the amount of distilled water is added drop by drop, and the slide gently tilted, in order to mix the two solutions. The preparation is then left to stain for about thirty minutes, when it is quickly washed in distilled water, equally quickly dried in the air, but not by heat, and mounted in Canada balsam, or examined in oil.

2. Method.—Here the films are not fixed. One part of Leishman's stain is mixed with two parts of distilled water in a watch-glass, and this mixture is gently poured over the film, and allowed to stain for twenty-five minutes. After which the preparation is gently washed, dried, and mounted.

According to Leishman³ the advantages of the second method are greater freedom from debris, easier detection of the spirochaete, and the spirochaetes appear more numerous than in the fixed films, owing to their being more deeply stained.

I find that a method intermediate between the first and second gives the best result on freshly-made films.

The duration of staining may in either of the above methods be increased, but there is more risk of the background becoming coloured, or a granular deposit taking place. A very good plan is to stain the films for about fifteen to twenty minutes, then roughly but quickly wash, and stain for another fifteen to twenty minutes.

Prolonged staining is, in my experience, attended with a risk of a granular deposit, or a flocculent scum, which settles on the surface of the film and slide. In order to obviate this I have tried staining the slides in wide-mouthed bottles or tubes, but I do not think this is as successful as the following simple plan:

The Leishman stain is poured on the film, and after a few seconds—say ten—double the quantity of distilled water is added, and then the diluted stain is poured rapidly on to the surface of a slightly curved piece of glass, and the slides laid, film-side downwards, on the stain. In this way any precipitate in the stain falls on the sheet of curved glass.

Giemsa's Stain.

This should be bought ready prepared from Grubler or from the agents—for example, Baker, 244, High Holborn.

For use the stain is prepared as follows: To 1 c.cm. of distilled water a few drops of 1 in 1,000 solution of sodii carb. are added, and then 1 drop of Giemsa's stain; mix. The air-dried films are fixed for five to ten minutes, or longer, in absolute alcohol, or for one to five minutes in methylic alcohol, and then the above solution of stain is poured on and allowed to act for one hour. The preparations are then rapidly washed in distilled water, quickly dried, and mounted in Canada balsam or simply examined in oil.

Film preparations can also be stained without previous fixation, as in the second method of Leishman; the only point to attend to is to pour the staining solution on gently and very carefully wash, or otherwise the unfixed film will be washed off.

Burroughs, Wellcome, and Co. have made "soloids" of eosin-azur for the Giemsa stain, and as these are dissolved merely in

pure methylic alcohol the films need not be previously fixed. These give excellent results. The method and duration of staining are precisely the same as that mentioned for using Leishman's stain.

With all these staining methods there is a little compromise to be made, as, the longer the duration of staining, the darker the organism and the thicker it appears, but the greater the tendency to a deposit.

THE EXAMINATION OF THE SPIROCHAETA PALLIDA IN THE LIVING CONDITION.

Hoffmann⁴ says that for the expert endowed with keen vision the easiest and most rapid method of detecting the *Spirochaeta pallida* is to examine it in its living condition. For this purpose he considers a good apochromatic $\frac{1}{2}$ in. objective, with compensating ocular 6 and 12, indispensable. He advises the use of cover-glass instead of hanging-drop preparations, which are rung round with vaseline to prevent evaporation. These are made from the serum alone or the serum diluted with normal saline solution, in which he found the spirochaetes still living for a week. Hoffmann states that Reuter could not see the living *Sp. pallida* with an ordinary Zeiss achromatic $\frac{1}{2}$ in. objective, but with an apochromatic Zeiss $\frac{1}{2}$ in. it was plainly visible.

My experience with regard to the visibility of the *Spirochaeta pallida* in the living condition in cover-glass preparations of the serum is rather interesting. Working with a magnificent $\frac{1}{2}$ in. achromatic objective of Leitz of N.A. 1.30, and also with Swift's $\frac{1}{2}$ in. apochromatic objectives of N.A. 1.40, and compensating oculars 6, 8 and 18, combined with an oil-immersion condenser of N.A. 1.40, using critical image and working in a dark room, I can say that I have seen three or four living spirochaetes after hours of search under these favourable conditions.

I have placed a freshly made cover-glass preparation on the microscope, and with a Zeiss $\frac{1}{2}$ apochromatic objective of N.A. 0.65 and compensating ocular 18, with the new dark-ground condenser of Leitz and with a Nernst lamp, I have found a field containing fifteen to twenty actively moving *Spirochaeta pallida*. Without moving the slide in the slightest, I have substituted the ordinary condenser, both oil-immersion and dry, have turned on the $\frac{1}{2}$ in. objective, and replaced the Nernst lamp by a paraffin lamp, and have been totally unable to see one spirochaete in the selfsame field, even after a considerable time.

Further, I have returned to the dark-ground method, and, having found a long or specially well-marked spirochaete, I have noted its exact position as regards, say, a red blood corpuscle. Retaining the slide in that position, I have replaced the existing apparatus by the $\frac{1}{2}$ in. objective, with the ordinary condenser, and have seldom, even after prolonged examination, seen that spirochaete.

In other words, I find that the *Spirochaeta pallida* is, under the most favourable condition, almost invisible, even when known to be present, when examined by $\frac{1}{2}$ in. objective with ordinary transmitted illumination. This does not imply that the organism is beyond the range of visibility owing to its small size, but that it is practically invisible owing to its very slight refractive index.

Examination by means of Dark-ground Illumination.

By means of the new dark-ground condensers, however, it is now possible not only to see, but to see easily, many organisms with comparatively low powers.

Such condensers, made by Reichert, Zeiss, Leitz, Beck, and others, vary somewhat in their principle and construction. I have tried all of them, and prefer that made by Leitz.

A brilliant source of illumination is absolutely essential in using any of these dark-ground condensers. Briefly, my outfit consists of the following:

1. A Leitz dark-ground illuminator.

2. Nernst $\frac{1}{2}$ ampere lamp.

3. A Nelson's aplanatic bull's-eye condenser. Probably the new small arc lamp recently introduced by Leitz would be better. It has a bull's-eye condenser fitted with it.

4. Slides of a given thickness (1 mm.), and cover-glasses preferably of known thickness.

Full directions are supplied with any one maker's condenser, and a short but good account is also given in Spitta's *Microscopy*, second edition, the best treatise on the microscope published in the English language.

The dark-ground condenser having been placed in the sub-stage and centred, the light from the Nernst lamp concentrated

by the bull's-eye thrown on the mirror, the slide holding the fresh serum preparation is placed on the stage and is oiled to the condenser.

I use Zeiss apochromatic $\frac{3}{4}$ objective with compensating ocular No. 18, which gives approximately a magnification of 560 diameters. Leitz $\frac{3}{4}$ in. oil-immersion objective may be used with his dark-ground condenser, provided its N.A. is cut down to 0.9 by a special stop which he supplies. This I find answers admirably.

The use of an immersion $\frac{3}{4}$ objective cut down by a stop to a N.A. of 0.9 has the following advantages: (1) Increased magnification, (2) the cover-glasses need not be of specified thickness, (3) the image is considerably brighter, and (4) the resolution is greatly increased.

It is not essential to use apochromatic objectives for this method of examination, an ordinary $\frac{3}{4}$ with deep eyepieces is suitable, but the achromatic dry lenses do not give as good a view as the apochromatics.

Spirochaeta pallida examined by this method appear as shining silver-like threads with corkscrew turns lying on a black or blackish background. They will be seen to possess three movements—namely, rotation about the longitudinal axis, forward and backward gliding motion, and flexion of the whole body.

Of these, the last-named is the most easily seen and the most characteristic. It is a slow bending motion. The rotation about a longitudinal axis is to be seen with the stopped $\frac{3}{4}$ in. objective, and gives the impression of a screw being turned. The forward and backward movement is—at least when examined in its natural fluid, the serum—very slight indeed. If there be streaming movement of the serum, which is often induced by evaporation at the margin of the cover-glass, the spirochaete will be carried rapidly across the field, and it may soon be out of sight.

The actual movement of locomotion is under ordinary condition so slight that I should hardly expect to find that the organism had moved much from the exact spot at which it had been seen an hour previously. This is very different from what is met with in the other spirochaetes—for example, *Spirochaeta refringens* or *Spirochaeta balanitidis*.

Eiter⁵ gives the following excellent description of the *Spirochaeta balanitidis*, and I may add that, in the absence of a case of that disease, one can see all the movements he describes in the *Spirochaeta buccalis* by simply making a cover-glass preparation from the scrapings of one's teeth.

When seen by means of the dark-field illumination this spirochaete appears pale yellow to deep orange red, as compared with the delicate white of the *pallida*. The body is fatter, the windings are longer and flatter, and it is much more energetic than the *pallida*. It moves rapidly in jerks backwards and forwards, frequently crossing the whole field with one impetus. At times it moves with a wave-like progression, either like the movements of a snake or those of a caterpillar. The wave-like movement, which does not cause the spirochaete to move in its entirety, is seen in this form as in the *pallida*. Besides, one sees screw-like movements, by which the body progresses by means of a rotation on its long axis. The *pallida*, on the other hand, moves in three ways: (1) Rotation around the long axis, (2) by bending its body, and (3) by jerks backwards and forwards. It seems, however, that the *pallida* do not move widely or energetically, and when a *pallida* spirochaete is seen crossing the field, it is always being carried in the current of the fluid medium.

So far as my experience goes no other organism could be easily confused with the *Spirochaeta pallida* when seen by dark-ground illumination, except the *Spirochaeta dentium*. This organism, which is found in small numbers in the tartar of the teeth, resembles the *Spirochaeta pallida* in its white silvery colour, its numerous turns and its movements, but it is much shorter, measuring on an average 5 to 8 μ with 6 to 16 windings.

As to the duration of the life of the *Spirochaeta pallida*, I found that in cover-glass preparations made from the serum taken from a primary sore, some of the spirochaetes were recognizable at the end of thirty-one days, and that they still possessed their characteristic bending or slight swaying movement.

Examination of Stained Specimens.

The *Spirochaeta pallida* in stained preparations is seen to consist of very fine spiral threads which measure on an average 6 to 15 μ long, although some reach 16 to 24 μ , and about $\frac{1}{4}$ μ wide.

It possesses a number of extremely regular, deep, and closely approximated spirals. They vary in number from

6 to 22 μ , and the width of the curves, or the distance from the summit of one convexity to that of the next, is very constant—that is, about 1 to 1.2 μ . This is a very important characteristic, and can easily be ascertained by measuring the length of the organism, and dividing that figure by the number of curves. If an eyepiece micrometer is not at hand, the curves may be measured with tolerable accuracy, as pointed out by Leishman, by comparing a spirochaete with a red blood corpuscle of which the average diameter is 7.5 μ , when it will be found that a spirochaete in this distance will have from six to seven turns.

Both ends of the organism terminate, as a rule, in a very fine point, or, according to Schaudinn, in a fine flagellum, which I have, however, not seen.

The whole organism looks, as Schaudinn described it, as if it were a spiral turned out of a lathe. This typical spiral form is seen not only when the organism is in motion, but also when at rest, whilst all other analogous spirochaetes of this type show the spirals only when they are actively moving; when they are at rest they become nearly straight, or have very long flattened-out undulations. Schaudinn points out that there is only one spirochaete, the *Spirochaeta dentium*, of which we have spoken before, which has smaller fixed spiral arrangement.

The great length of the sharply-pointed threads in proportion to its remarkable thinness, the depth, steepness, and regularity of its corkscrew windings, the slight variations in form, the relatively great elasticity, with slight deformation of the spirals, the slight refractiveness, the method of movement in the living condition, and finally the reddish tint that it stains by Giemsa's stain, are the diagnostic features (Hoffmann).

Most of the other spirochaetes are distinguished from *Spirochaeta pallida* by the greater thickness in proportion to their length, their markedly refractile character, the blunt ends, the much more active movements—eel-like—with greater change of position. The spirals are much flatter, more irregular, the organism more pliable, and therefore their form is more changeable, and when stained by Giemsa have a bluish-red tint.

The number of *Spirochaeta pallida* found in a cover-glass or film preparation taken from a primary sore varies enormously. In fresh films, examined with $\frac{3}{4}$ objective and 18 eyepiece, I have seen as many as ten to fifteen on one field; and in stained films made from the same preparation, and examined with $\frac{3}{4}$ objective and No. 2 ocular, I have found three, four, or even six organisms in one field, but this, as far as my experience goes, is very exceptional. Hoffmann says that the spirochaetes vary considerably in number even in the same lesion. Quite recently I had a good example of this in a primary sore from which I took two films made from the serum obtained by scraping the sore with a sharp spoon. In these films, taken at 10 a.m., I found very numerous *Spirochaeta pallida*; but when I took some twenty-four films (dry and moist preparations) from the same sore, from serum obtained by briskly rubbing the surface of the lesion, I found exceedingly few organisms, although these were taken only ten hours later in the day and the wound had not been touched in the interval. Hoffmann mentions, as an example of the unequal distribution of the specific organisms, a case with two primary sores on the abdominal wall, lying quite near one another; in the one he found the spirochaetes very numerous, in the other none, although the chancres were clinically indistinguishable.

EFFECT OF TREATMENT.

As to the effect of treatment on the spirochaetes, mercury given internally and mercurial wash or iodoform ointment applied externally is undoubtedly associated with a gradual diminution in the number or an actual disappearance of the spirochaetes, and this takes place more rapidly in some cases than in others.

The following is an example of the rapid disappearance of the organisms in a case recently under my care:

February 5th. Case first seen; typical large indurated sore with enlarged inguinal glands. *Spirochaeta pallida* very numerous both in fresh films examined by dark-ground illumination, and in stained preparations. Gave hydrarg. c creta internally, and locally iodoform.

February 12th. Sore beginning to heal; spirochaetes markedly diminished.

February 20th. Sore not healed. Spirochaetes only found with difficulty.

March 2nd. Sore not healed. No spirochaetes found in fresh or stained films. Gland juice obtained by aspiration of the lymphatic gland—entirely negative.

CONCLUSIONS.

1. The easiest, quickest, and by far the most certain method of detecting the *Spirochaeta pallida* is by the examination of cover-glass preparations made from the serum, by means of dark-ground illumination.
 2. That the most important part of the whole procedure is the correct taking of the material, whether for fresh or dry film preparations.
 3. That it is not essential to examine fresh films (which have been rung round with vaseline) at once, as the organism may be recognized some days later.
 4. That the serum of irritation may be conveniently taken in capillary tubes or blood capsules, provided the ends are sealed, and cover-glass preparations made from it may be examined at leisure.
 5. That whilst the finding of the *Spirochaeta pallida* indicates, as far as our knowledge goes at present, syphilis, a negative examination is of little value, at most it only justifies a suspicion that the disease is not present.
- P.S.—I should add that the *Spirochaeta pallida* in stained preparations somewhat fade sooner or later. This fading of aniline stained preparations, blood or other films, when mounted in Canada balsam is a source of great disappointment. I have tried Grubler's neutral balsam, but with only moderate success. I should be delighted to hear of a mounting medium in which aniline stained preparations were permanent.

REFERENCES.

¹ Preiss, *Pester Med. Chir. Presse*, November 8th and 15th, 1908; *EPITOME, BRITISH MEDICAL JOURNAL*, February 13th, 1909. ² Ehrlich, *Journ. Roy. Micro. Soc.*, December, 1908. ³ Leishman, *Manual of Venereal Disease*, by Officers of R.A.M.C. ⁴ Hoffmann, *Die Aetiologie der Syphilis*, Berlin: Julius Springer, 1906. ⁵ Eiter, *Muench. med. Woch.*, April 16th, 1907; *EPITOME, BRITISH MEDICAL JOURNAL*, June 13th, 1908.

Memoranda :

MEDICAL, SURGICAL, OBSTETRICAL.

THE ETIOLOGY OF BERI-BERI.

I HAVE read with interest the report in the *JOURNAL* of April 24th, p. 1007, of the meeting of the Society of Tropical Medicine and Hygiene at which the etiology of beri-beri was discussed, and observe that it was suggested that after the husk was removed from rice an epiphyte developed outside the grain and generated a nerve toxin. In the *JOURNAL* of November 28th last there is an interesting note by Dr. Saldanha, in which he says that there is a fungoid disease of rice, the active principle of which he calls "arsin," and to which he attributes the disease. He points out that the Chinese cook rice with the dust on it as it comes from the sack and thus consume the arsin. It is perhaps worthy, therefore, to note that in Korea, where I have been for five years, beri-beri does not seem to be common, although rice is as exclusively the diet of the people as in China, and Dr. Saldanha's theory suggests a reason for this immunity. The Koreans are extremely particular about washing rice before cooking it, and though they often drink the water in which it is boiled, as do the Chinese, they very carefully mix it with several separate quantities of water, each of which is poured away before the cooking commences, the process lasting five to ten minutes. This serves to remove all dust and the arsin which Dr. Saldanha tells us it contains, and may account for the fact that I have not seen a single undoubted case of the disease in five years.—I am, etc.,

London, W.

HUGH H. WEIR.

SULPHURIC ACID IN CELLULITIS, BRONCHIECTASIS, AND CONSUMPTION.

As we have received inquiries from different parts of the country as to whether we have used the treatment mentioned in our note in the *BRITISH MEDICAL JOURNAL*, p. 407, August 15th, 1908, on the use of acid. sulph. dil. in large doses (20 to 30 minims well diluted every four hours), for pathological conditions other than cases of furuncu-

losis, we may mention that we have used it with equal success in cases of acute cellulitis arising from an infected skin abrasion caused by bones from *high game* and also with great benefit in checking the profuse expectoration in cases of bronchiectasis, and in the sweating and expectoration in cases of pulmonary tuberculosis.

In a case of a suppurating dermoid which we are now treating in this way the result so far is not so successful as in the above-mentioned conditions, no doubt because the infected area is encysted.

J. REYNOLDS, M.D.

London, S.W.

RUSSELL J. REYNOLDS, M.B., B.S.Lond.

ACUTE ADDISON'S DISEASE.

H. Y., female, aged 33, was said to have suffered from chronic bladder and kidney disease for five years. When first seen on March 8th, 1909, she complained of increasing weakness and loss of appetite of three weeks' duration. She was thin and ill nourished, and the urine, of which she passed 2½ pints in twenty-four hours, was alkaline, and contained a considerable amount of muco-pus. Both kidneys were easily palpable, but not tender. Beyond this there were no physical abnormalities, and there was no pain and tenderness in the abdomen.

On the next day she commenced to vomit after any food, and even without food. Day by day she grew weaker, and the vomiting continued until March 16th, when she was given 5 grains of suprarenal extract every four hours. For twenty-four hours she became brighter, and the vomiting ceased, but soon the symptoms resumed their course, and on March 24th she died. During the last few days she lost the power of swallowing, and was fed by a nasal tube. Enuresis also set in. Consciousness was retained until the moment of death.

Permission for a *post-mortem* examination was readily given. The kidneys were in a state of advanced tuberculosis, very large, and riddled with cavities containing pus and caseous material. The capsules of the kidneys were studded with tubercles. The bladder was thick-walled, and there were numerous ulcers. The suprarenal glands were covered and permeated by miliary tubercles. The remaining organs were not affected.

The diagnosis during life seemed to lie between hysterical vomiting and Addison's disease, especially as there was a definite history of former nervous attacks of a melancholic type, accompanied by difficulty in feeding. The marked though transient effect of the extract of suprarenal gland was of great interest.

London, N.

A. F. SHOYER, M.D.

TREATMENT OF RHEUMATOID ARTHRITIS BY CATAPHORESIS.

FROM the memorandum by Dr. J. Curtis Webb in the *JOURNAL* of April 17th, p. 952, I gather that in the treatment of rheumatoid arthritis by cataphoresis he is in the habit of applying the positive and negative electrodes moistened with the same solution on either side of the joint affected. I venture to suggest that he will get better results if one electrode and one solution be applied to the particular joint, while the other electrode is placed elsewhere on the body.

My method is to surround the joint affected with a large pad of lint of ten layers in thickness soaked in the particular solution, and to place round this pad a metal gauze electrode tightly bound to the limb and connected with the negative pole. By this means salicylic acid is introduced when a solution of sodium salicylate is employed; iodine when potassium iodide is used, and chlorine when sodium chloride is applied. The positive electrode, laid on a large pad of lint soaked in an ordinary salt solution, may be placed on another part of the body. I can speak from personal experience of the value of this treatment in reducing swelling, alleviating pain, and lessening rigidity of the tendons in cases of rheumatoid arthritis.

Glasgow.

W. F. SOMERVILLE, M.D.

UNDER the will of the late Mr. Alfred Midgley of Buxton, a Manchester merchant, the Huddersfield and Manchester Infirmarys each receive a bequest of £1,000.