One was incubated at 39.4° C. the other at 32° C., resulting in 285 colonies at the higher temperature and 15 colonies at the lower. It would have been far more satisfactory to have used the same liquid at the other temperatures required at the same time, but there were only two incubators at my disposal. In consequence of this, a fresh cultivation had to be made every two days and used anew for each subsequent comparison. Thus no comparison between one pair of groups and another can be made. In the second comparison one plate was incubated at 37.5° C. and produced 1,568 colonies, while the second at 27.5° C. produced 690 colonies. In the third, 38.5° C. produced 153 colonies, and 32° C. produced 42 colonies.

"The above, although consisting only of one set of experiments, conclusively proves in respect of that particular strain of the organism that a temperature of a few degrees less than that of the body prevents so active a growth.

"It may be that the comparatively more vigorous growth at the lower temperature in the later experiments was due to the organism having been brought up on artificial media, and so had become less virulent. It may be noted that Dr. Washbourn points out that the avirulent varieties have a stronger growth at lower temperatures than those of a virulent character."

These observations appear to indicate that a moderate reduction of temperature does exercise a marked inhibitory influence on the rate of growth of the pneumococcus. If they are confirmed by subsequent and more extended investigations they will furnish a scientific justification of the employment of the icebag in the treatment of pneumonia.

Whether or not this scientific basis can be claimed for the treatment any one who will thoroughly and carefully employ it in the manner already detailed, and with the precautions above mentioned will soon be convinced of its practical usefulness. Any estimate of its value, founded on the use of one icebag only, in cases seen only two or three times in the week, and without any careful percussion of the right heart and any attempt to relieve it, is worthless.

One striking fact which ought not to escape notice is the great improvement which an efficient ice treatment often produces in the physical signs before the crisis. This may be very distinct even two or three days before the crisis, and already very great indeed when it occurs. Another striking fact is the more rapid convalescence. This is natural enough, for if the microbic growth is inhibited there is less poisoning of the tissues, less dead material to be absorbed and eliminated, and less diminution of the patient's strength.

One point remains to be noticed. Some physicians look upon pneumonia as a blood disease with local lesions, and would, therefore, consider the icebag treatment as irrelevant and useless. Now it is true that occasionally pneumococci have been detected in the blood of pneumonic patients, but Dr. Washbourn held that it is only in a few severe cases that this can be done. This difficulty in detection indicates that the number in the blood is comparatively small. In whatever way the organisms may have reached the pulmonary alveoli in a case of pneumonia, whether by inhalation or by the blood current, it is certain that their chief, probably in most cases their only, seat of multiplication is the lungs. From the lungs they no doubt often pass into the pleura, sometimes into the pericardium, occasionally into the blood current, especially in the worst cases.

Dr. Washbourn has proved experimentally that it is possible for pneumococci introduced into the air passages to pass through the lungs and produce pleurisy and pericarditis without any implication of the lung tissue itself. Clinically such cases are met with, but they are much rarer than pneumonia. Yet it remains true that the chief site of pneumococcal growth is in the air cells of the lungs, and that the congestion and the production of fibrin are the local results of this growth and of the toxins thereby produced. On these points there is some valuable information in Dr. Auld's *Selected Researches in Pathology*, published in 1901. He says: "If a pure, moderately virulent culture of the pneumococcus be inoculated, either subcutaneously or into the internal cavities of a susceptible animal, it produces around the site of inoculation intense congestion, exudation of sanguineous serum, and fibrin. That is its characteristic and invariable lesion, and it produces directly no other. Should resolution not occur soon, we have, of course, after a variable time, an exudation of leucocytes, the gradual collection of which may give rise ultimately to what has the appearance of a mass of pus."

By inoculating beneath the skin of a rabbit rusty sputum

from a case of pneumonia, and killing the animal within thirty-six hours, Dr. Auld found that its heart blood contained a pure culture of the pneumococcus. He grew these on solid and liquid media, and made injections into the pleural cavity of rabbits, causing always a severe pleurisy, frequently severe congestion of the lungs, often more or less consolidation, in two cases pneumonic consolidation of an entire lobe, usually also pericarditis. The local lesions, lungs, and spleen of these rabbits were subjected to a chemical analysis, and from them were obtained an albumose and an organic acid. The latter gave the reactions for lactic acid; it was not toxic on injection into animals. Dr. Auld suggests that the production of this acid may have an inhibitory effect on the further growth of the pneumococcus.

But the albumose acted very differently. When injected beneath the skin of the rabbit's ear, local inflammation of the ear was produced and a rise of temperature; recovery followed. Intravenous injection produced initial shock, followed by a marked rise in temperature, but no other pathological effect. Injection into the pleural cavity produced no initial depression, but marked dyspnoea soon set in, followed by rise of temperature. The animal was killed on the third day, and found to have right-sided pleurisy, with complete consolidation of the lower lobe of the right lung. No other lesions were found. Inoculations were made from the blood, and also from the serum in the pleural cavities in solid and liquid media, with a negative result. A larger quantity of the albumose was also intrapleurally injected in another rabbit. Next day the temperature was 104.6°. On the following day the animal was killed, and severe right lateral and also diaphragmatic pleurisy was found, with pericarditis and hard consolidation of the upper part of the lower lobe of the right lung, very typical of ordinary lobar hepatization.

Thus it seems that the consolidation of lung in pneumonia is largely due to the local effects of an albumose produced by the growth of the pneumococcus, and that the pyrexia is due to the same cause.

A similar albumose was obtained, in smaller quantity, by growing the pneumococcus in albuminous media free from albumoses, and it was found to produce similar results on injection into rabbits, thus proving that the pneumococcus has the power of forming a highly toxic albumose from proteid material. Much larger doses, however, were required, showing that the production of toxin is much more active in the living body than in artificial media.

Another interesting observation of Dr. Auld's may also be mentioned. He found by injection of pneumonic toxins obtained by filtration of cultures of the pneumococcus that the effect of such injections was to make the animals subjected to them more susceptible to subsequent infection with the pneumococcus than normal animals. This susceptibility appeared to last for a long period. The clinical importance of this fact is obvious.

REFERENCES.

- ¹ Practitioner, 1900, p. 36. ² Ibid, 1900, p. 285. ³ Croonian Lectures, Lancet, 1900.

SYPHILITIC JOINT DISEASE.

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THOUGH syphilitic disease of the joints is not of very frequent occurrence it is not improbable that it is somewhat more so than is generally supposed, as it is not difficult to see how it may be either overlooked or mistaken for some other affection, such as osteo-arthritis, and it is probably still true, as Professor Howard Marsh¹ says in his work on the *Diseases of Joints*, that this trouble has hardly received the attention from English surgeons that it deserves.

A number of these cases having come under my notice, and as I have also looked somewhat closely into the literature of the subject and examined the few specimens that are to be found in the museums in London illustrating the morbid anatomy of the disease, I have thought it might be of service to put the results on record.

That syphilis—or, at any rate, venereal disease—might affect the joints seems to have been known to Petrus Martyr in 1488; the disease is also referred to by Alphonsus Ferrus in 1537; and by Morgagni and Fabre in the seventeenth century. Hunter, however, thought that syphilitic disease did not occur; in this view he was opposed by others of his time, but the earliest clear account of the disease seems to have been given by Richet² in 1853.

It is very difficult to arrive at the frequency with which the disease may be expected to occur, as I have found practically no statistics on which a satisfactory estimate can be made, though Zeissl³ states that of 1,000 cases of syphilis seen at a hospital for venereal disorders, only one was found to have any joint disease; as he, however, remarks, it is not improbable that patients affected with joint disease only would go to a general hospital, and thus these figures are not to be very much relied upon.

Varieties.

Various classifications of the varieties of the disease occurring as the result of acquired syphilis have been given; the following seems to include all the varieties that I have seen or that I have been able to find a clear account of in the numerous articles mainly written on the Continent, which I have consulted.

During the secondary stage of the disease the following may occur: (1) Arthralgia; it may be doubted if this really is a joint trouble, properly speaking, or if the pain may not be in the parts around; (2) synovitis, acute or subacute; (3) hydrarthrosis.

During the tertiary period the following types may be seen: (1) Synovitis subacute or chronic, so chronic in some cases as to be examples of hydrarthrosis; (2) gummatous, the gummata being in the synovial or subsynovial tissue; (3) cases in which the bone or cartilage is primarily diseased; (4) cases in which the disease has spread to the joint from the parts around; (5) ankylosis, which is rather a termination of one of the other varieties of the affection than a variety by itself.

1. In *arthralgia*, due to secondary syphilis, the pain may be very intense in and around the joint. It is often, like other syphilitic pains, worse at night; it is not increased by movement, and the range of motion is not at all impaired as a rule, though there may be a little stiffness of the joints affected in the morning, after they have been at rest all night; indeed, the pain may be relieved by movement; there may be a little local tenderness. This trouble usually occurs in the early stages of the disease, even sometimes before the eruption has appeared. It is doubtful if any changes would be found in the joints if they were examined, as there are no physical signs save those named. Several joints are often attacked at the same time. Fournier⁴ speaks of these cases as common, though in the case which he recounts there was not a purely painful condition but also some effusion. The condition is also described by Voisin⁵ and many others.

2. *Synovitis* is, however, the common trouble during the secondary stage. It may come on without any warning as an effusion, usually associated with some pain and tenderness, which is not increased by movement, and it may be quite unattended with any other sign or symptom, there being no constitutional disturbance, but in other cases there is an antecedent *malaise*, with some rise of temperature and a good deal of local pain, in addition to the effusion, and the patient may be generally ill; in fact, in some respects the resemblance may be very close to rheumatic fever, and the condition has been described by Vaffier⁶ as "syphilitic rheumatism," though some of the typical features of that disease are absent, such as cardiac troubles, or the acid sweats which are usually seen in rheumatism. Usually in this type many, or, at any rate several, joints are attacked at the same time, so that in this respect rheumatism may be very closely simulated. Vaffier⁶ gives notes of several cases, of which the following is a characteristic example:

A sailor who had never had rheumatic fever first noticed a chancre on May 28th. He was treated with mercury for a time; this was then intermitted. On July 22nd he began to complain of general weakness and pain in various parts of the body on movement; there was a little swelling over the left knee-joint, and also of the finger-joint and toe-joint. There was no heart trouble. On August 8th he had some rise of temperature, and the right knee and left shoulder became affected. He now developed a rash. The mercury, which had before this attack been given up, was again returned to, and also some potassium iodide administered. Under this treatment he very rapidly got well.

Descriptions are given of the secondary symptoms by Pielicke,⁷ Finger,⁸ Fournier,⁹ Lancereaux,¹⁰ Sherren,¹¹ and many others.

3. *Hydrarthrosis*, when present, nearly always attacks the knee; it usually only occurs late in the secondary stage, when it begins as a primary affection, but it may succeed the more acute synovial effusion above described. It is usually quite unattended by any other trouble than the effusion, which comes on gradually without any pain. The diagnosis depends on the detection of the primary disease, and also in doubtful cases on the effect of treatment by mercury and iodides.

A typical example is one given by Voisin¹² in a patient who had contracted syphilis six months previously. He slowly developed a simple effusion into the knee-joint, which gave him no pain or other trouble; it cleared up entirely with antisyphilitic treatment.

As to the morbid anatomy of the conditions described above, only views founded on what has been noted clinically can be put forward; for as far as I am aware there has been no opportunity for making a necropsy on any such cases; there is no likelihood, however, that anything would be found beyond a little redness, due to increased vascularity of the synovial membrane and other parts entering into the formation of the joint, in addition to the presence of an excess of synovial fluid.

The diagnosis will generally have to be made from rheumatism, which is usually easily done by the presence of the signs of syphilis, the absence of sweating, the want of rapid migration of the pain from one joint to another, the comparative mildness of the constitutional disturbance, and the results of treatment. Gonorrhoeal joint trouble may present greater difficulties of diagnosis; but here there is usually more pain and fixation of the joint, and also the presence of a urethral discharge may be observed or a history of it obtained, but the effects of mercury and iodides are the final resort to determine the nature of a doubtful case.

1. In cases of tertiary synovitis the knee-joint is most usually affected—as, indeed, is the case with all the varieties of tertiary syphilitic joint disease. The trouble is one which is usually associated with very little pain or interference with motion, so much so that this may be one indication of the nature of the case, though of course painless effusions occur from other causes. Usually a little thickening of the synovial membrane is also present and a little creaking on movement; the amount of fluid present varies a good deal from time to time. Occasionally there may be a little rise of temperature, but this is unusual; two cases, however, are described by Duffin¹³ in which the temperature was subject to the most marked diurnal oscillations, a peculiarity which has been also sometimes noticed in connexion with other tertiary lesions.

These cases are most likely to be mistaken for osteoarthritis, and if there are no other signs of syphilis it is hard to see how this can be avoided, and in view of the fact that iodides are frequently given for osteo-arthritis disease it is not unlikely, as has been pointed out by Professor Howard Marsh,¹⁴ that this mistake may be made without its being discovered more frequently than is supposed. So far as I am aware no opportunity has occurred for examining the condition of such a joint after death, but it does not seem very likely that any very marked change would be found if this were done.

2. Gummatous disease may begin in a manner very like the last variety, that is to say, with an effusion of fluid, and subsequently the gummatous mass may be felt; but in some examples there is never any fluid present to any large amount, or, indeed, there may be none at all throughout; and, under these circumstances, the most noticeable feature is the lumpy thickening of the synovial membrane which occurs in a very irregular manner. The pain which is present is very variable in amount, and is frequently worse at night though there is no starting pain. Even with very extensive disease there may be very little limitation of movement, and motion may cause very little pain, though this is not always so. Remission, and indeed an almost apparently complete cure of a case, is often followed by a recrudescence, and this is very characteristic of the disease.

Sometimes the gummatous condition so completely involves the joint that its cavity is almost filled up by it, and in such a case the resemblance to tuberculous disease is very close, though usually not quite so close as in the cases next to be referred to in which the bones are involved. The following is an example of this condition:

A man, aged 50, who had suffered from syphilis some years before he was seen, had for some time before he came for treatment been complaining of pain and some difficulty in moving his left knee-joint. On examination this was found to be a little hotter than the other one, and there was some limitation of movement, but motion gave very little pain; the synovial membrane was to be felt thickened in a lumpy manner in several places; there was no grating nor any creaking on moving the joint. The man was put on potassium iodide in increasing doses, and very soon had practically lost his pain, and was able to use his joint more freely though not to the full extent; the thickening also became less. He then absented himself for a time, only to return again in the same condition as before, to be treated in the same way with the same result.

Another case was that of a man of about 40. He had an injury to his right elbow a month or so before he came under observation. When first seen there was a good deal of soft swelling on each side of his olecranon, and some limitation of movement with a little pain. There was no evidence of fluid in the joint. He was thought to have some sort of traumatic inflammation of the joint, and was treated by rest on a splint. But a week or two of this did not cause any improvement, and the case now assumed much more the characters of tuberculous disease, and the rest treatment was continued on this assumption; but the posterior swelling increased and appeared to soften, so that it was thought that fluid (probably pus) was present. A small incision was made, this only revealed some granulation-like tissue but apparently not of a tuberculous nature. It was therefore thought the case might be one of syphilitic disease, and iodides were given with the result that he speedily began to improve, and the joint ultimately recovered with only a little impairment of its mobility. No history could be obtained of the disease, and there were no other definite signs elsewhere with the exception of one or two doubtful cutaneous scars.

Brochin,¹³ Richet,¹⁶ Lancereaux,¹⁷ and others recount very similar cases. A specimen of a joint with a gummatous deposit is to be seen in the College of Surgeons Museum, No. 1,756A, but in this case the disease is not confined to the soft parts, but affects the cartilages as well. Gummatous disease seems, as a rule, to begin in the subsynovial tissue, and to pass from there to the joint itself, but it sometimes also attacks the ligaments. This form of disease is eminently curable, though it shows a very considerable tendency to relapse, and if it is allowed to advance too far before the proper treatment is started a good deal of damage may be left to the mobility of the joint from adhesions which form within it.

A similar invasion of the synovial membrane is to be seen in a specimen in the St. Bartholomew's Museum, No. 567A. In this specimen the gummatous deposit has involved the upper and anterior part of the membrane, and in some places it has ulcerated, and projects into the joint in irregular lumps and fringes; there were several ounces of dark grumous material in the interior of the joint.

3. Much more serious damage, as a rule, accrues to the joint when the primary disease is in the bones or cartilages; is curious, however, even in these cases how very little may be the pain which the patient may suffer as compared with that caused by a tuberculous joint damaged to the same extent, though sometimes it may be severe enough, but it is usually not of the starting nature which, when the cartilages have been destroyed, is so characteristic of tubercle.

Some thickening of the synovial membrane is always to be felt, and there is usually much limitation of movement, and often some deformity of the joint, either the consequence of the destructive process, or due, in addition, to the contraction of the fibrous tissue, which has invaded the other parts of the joint besides the bones, as well as the action of the surrounding muscles.

Thickening of the bone ends may be a very marked feature, and sometimes lipping of their edges may be detected; but although specimens show indubitably that this lipping does occur it is never a very marked feature, and when it is noticed it is more likely to increase the difficulty of diagnosing the nature of the condition than to diminish it, by causing a confusion with osteo-arthritis, to which in any case there is a very great similarity, and from which the trouble can often only be separated by the knowledge of a history of syphilis or the results of treatment. If, however, there is a good deal of thickening of the soft parts the appearances approximate more to those to be found in tuberculous disease.

From what has been said above it will be seen that no very definite points can be given for the diagnosis of such cases. But should syphilis be suspected the presence of other signs of the disease, and the speedy results obtained by appropriate treatment, will make the case clear.

Several specimens of this type of the disease are to be found in the museums. A case of Davies-Colley's¹⁸ in Guy's Museum, No. 1,334¹⁹, shows the bones of a knee-joint with much-pitted erosion, complete loss of cartilage, some grooving, and in one or two places definite eburnation, and a little increase of bone at the margins of the articular surfaces in one or two places. The parts were removed from a syphilitic male aged 34.

Another specimen in the same museum, No. 1,334²⁰, shows the left femur with deep erosion of one of the condyles extending into the bone, the edges of the erosion are clean cut, and the cavity did not contain any granulation masses such as would be found in a similar case if tuberculous, the patella and tibia in the same joint were superficially eroded, there was no pus in the cavity, and the articulation was otherwise normal. The right femur in the same case showed erosion of the femoral cartilage, and some wearing in the centre of the cartilage.

A similar condition is to be seen in the head of the humerus in the College Museum in a syphilitic child (No. 1,856 B.). Specimen 1,856 C.

in the same museum shows very much more destruction of bone in such a manner that the parts fit accurately into one another, the elevation left in one bone fitting into an erosion in the opposing bone, the articular cartilage has all disappeared. Davies-Colley thought this also to be a case of syphilis but there seems to be some doubt as to its being so. There are also several very interesting specimens in the St. Bartholomew's Museum which are almost certainly syphilitic: they were all taken from a boy, aged 16, and have been carefully described by Bowlby¹⁹ as syphilitic though Marrant Baker, under whose care the patient was, had some doubt as to their true nature, several joints as well as other parts are affected. Both shoulders, one elbow and one knee are shown (Nos. 312 B. C. D., etc.) the chief character of the changes is the gouge-like ulceration of the bones and cartilages, the ulcers thus formed being covered by only a thin membrane-like tissue, there is also some nodulation of the cartilages which has also undergone fibroid changes in places, the amount of thickening of the synovial membrane is not in most of the specimens very marked and it is not at all like that which one is accustomed to see in tubercle; microscopically there were no gummata to be found in this case.

In this type of case the affection may begin in the bones or cartilages. In the former it takes the form of a gummatous deposit which is accompanied by a syphilitic osteitis causing enlargement of the bone; as the deposit gradually increases it ultimately reaches the joint and opens through the cartilage into it; this may set up a good deal of reaction in the joint or it may not cause very much disturbance though it is most likely that a chronic synovitis will result. When the disease begins in the cartilages the process is one which has been described by Virchow²⁰ as "chondritis syphilitica." The condition is one in which loss, at the same time accompanied by a fibrous scarring, of the cartilage occurs in places, the loss does not appear as it does for the most part in osteo-arthritis at the points of greatest pressure but not infrequently is to be seen as circular pit-like excavations: but if fibrous change has occurred the fibroid infiltration does not result in a fibrillation of the cartilage but stellate scars occur which are very characteristic. Virchow says that there is never any increase in the cartilage to form ecchondroses and ultimately osteophytes, but although this is to a large extent true it is not absolutely so as increase of the cartilage does occur to some extent in some cases as is seen in some of the specimens described above.

It is clear that the changes which have been described if allowed to advance will practically destroy the joint and cause its fixation so that unless the disease is arrested at an early date, ankylosis, very likely in a faulty position, is all that can be expected; at the same time there is a very great liability for the trouble to recur when treatment is intermitted.

4. An affection of a joint in consequence of syphilitic disease in the neighbouring structures may take place as the result of the close proximity of a gummatous deposit causing some effusion, the joint itself not being really affected with any truly syphilitic affection. But much more serious trouble may arise when a gumma opens on to a skin surface near to a joint, and then subsequently the joint capsule becomes perforated, and the joint is infected with septic organisms from without; the result is a septic arthritis with its attendant dangers, and examples of both these conditions have come under my observation. Both cases occurred in women; in the example of the first-named variety it cleared up very rapidly under antisyphilitic treatment, but in the latter the joint became ankylosed and useless.

5. Ankylosis has been referred to as a result of syphilitic arthritis, and it is very important to bear in mind that this is likely to be the termination of any case of the gummatous disease of the synovial membrane or where the bones are diseased unless the affection is recognized early and treated actively, as if this is not done adhesions form which remain to permanently embarrass the joint, even if the gummatous thickening and bone changes to a large extent settle down. That ankylosis may occur in this way has an important bearing on the question of keeping such joints at rest for any length of time, as if this be done the fixation is likely to very much aggravate the ultimate limitation of movement; there is the less difficulty in allowing a certain amount of movement in these cases, as usually there is not as great an amount of pain attached to motion as there may be in other forms of joint disease, nor does it seem to interfere with the process of cure.

In hereditary syphilis the joints are not exempt from attack, and there is some reason for thinking that they are more often affected by this form of the disease than by the acquired variety; the various ways in which the joints are attacked have been described by Parrot,²¹ Fournier,²² Imbert,²³ Kh-misson and Jacobson,²⁴ Clutton,²⁵ Robinson,²⁶ Morestin,²⁷

Hutchinson,²³ and others. Some of the varieties bear a very close likeness to the forms which occur in acquired syphilis, but there are some which may be considered distinct.

They may be grouped as follows: (1) Simple synovial effusion; (2) joint disease associated with syphilitic epiphysitis; (3) primary gummatous affection of the synovial membrane; (4) osteitis associated with effusion only; (5) osteitis associated with gummatous disease of the synovial membrane (this is the variety which has been called pseudo-white swelling); (6) deforming arthritis.

(1) The first account of this condition was given, I believe, by Clutton,²⁵ and it is now very well known and appears to be not uncommon. It occurs in children usually between the ages of 8 and 15, and takes the form of symmetrical effusion into the joints, the knee being far the most commonly affected; there is practically no pain and very little interference with function, and although the amount of fluid may be considerable, there is no other change in the joint. It is very commonly associated with some other syphilitic trouble, particularly interstitial keratitis, and it is not unlikely that it occurs not infrequently without being recognized, and clears up with the treatment which is given for the other trouble present.

The following is a typical example of the condition:

A boy, aged 10, was first seen for characteristic interstitial keratitis. He happened to mention that he had been suffering from a little pain and some swelling of his knees, and both of them were found on examination to be full of fluid; there were no changes in the bones, no redness, tenderness, or heat, and practically no pain on movement. The whole condition completely cleared up under the anti-syphilitic treatment which was being given on account of the eye trouble.

(2) There may be some doubt whether, at any rate in some of these cases, the joint itself is really the seat of the disease, as so far as I have been able to discover there are no specimens or descriptions of them which show the condition when a joint has been affected, but, as far as can be judged from a clinical examination, the joint is invaded with the soft fungating inflammatory formation which is associated with the disease at the epiphysal line. The trouble occurs in infants usually between the ages of 1 month and 2 years, but cases are rare before the age of 3 months. The joint itself and the parts around have a soft, boggy feel, and the limb lies quite helpless; generally the swelling clears up very rapidly under mercury and with surprisingly little damage to the joint; occasionally suppuration occurs, and has been described as not uncommon by Parrot, but it is probable that when this happens there has been some form of secondary infection to account for it.

I recently had under my care a child about a year old with much boggy swelling around the left elbow-joint, the movements of which were very limited, but there was apparently very little pain in connexion with the trouble, though the child did not itself use the arm. There were no very definite signs of hereditary disease, but the condition rapidly cleared up under mercurial inunction.

Varieties (3) and (5) do not differ in any essential respect from the similar condition which occurs in acquired syphilis and which has been described above.

The typical condition in the variety numbered (4) is well described by Robinson²⁶ as very considerable enlargement of the end of a long bone such as the femur, with a greater or less effusion into the neighbouring joint, but with no other evidence of disease of the joint; it is not uncommonly seen in cases of syphilitic osteitis near a joint; any interference with the movements of the joint is due to the alteration in size of the bone and not to any change in the joint itself; the effusion usually clears up rapidly under appropriate treatment, but has a tendency to return when this is intermitted.

(6) Under the name of *arthropathie deformante* Fournier²⁷ has described a rare and very peculiar condition of the joints which occasionally occurs in connexion with hereditary disease. The main changes occur in the epiphyses, which become deformed in a most irregular manner by the production of osteophytic outgrowths which cause it to take a most irregular shape; the result on the joint is very marked deformity, much limitation of movement, and perhaps even partial ankylosis, though as there does not seem to be any very active change in the articulation itself this fixation is mainly due to the altered shape of the bone ends, which alteration may be so great that the cases have been mistaken for old dislocation of the joint rather than disease.

It is clear that in this condition very little improvement can be expected from treatment, though the progress of the

disease may be stopped, and if the condition is recognized early any great damage may be prevented.

Diagnosis.

The diagnosis of syphilitic disease of the joints is often very difficult. During the secondary stage the presence of other signs of the disease is generally the main element in settling the point, and in the cases of arthralgia there is really nothing else on which a diagnosis can be founded. The synovitis cases and those which resemble rheumatism are the ones which are most likely to lead to error. In the latter, which are by no means common, there are several points in which the features differ from true acute rheumatism, for example, the absence of sweating, the mildness as a rule of the constitutional disturbance, the absence of heat and redness in the joints affected, and the fact that the heart never suffers.

From the gonorrhoeal synovitis the syphilitic usually differs in that the stress of the trouble does not fall so much on the fibrous elements of the joints, and there is usually more effusion in the syphilitic cases; in addition, it may be possible to exclude a recent attack of gonorrhoea, and the influence of treatment by mercury and iodides is practically nil in gonorrhoeal cases, while, on the other hand, it acts usually very rapidly in the direction of ameliorating the condition if this be syphilitic.

The joint affections that arise during the tertiary period are most likely to be taken for either osteo-arthritis or tubercle, though it may also resemble gout and gonorrhoeal disease or some form of traumatic synovitis or arthritis. From osteo-arthritis the most noticeable distinctive points are the much greater tendency in this disease for the development of new bone as osteophytes, the more marked deformity that is therefore produced in the joints, while there is likely to be more marked creaking and grating and limitation of motion; but most important also is the absence of any direct evidence of syphilis and the effects of treatment.

The cases which resemble tuberculous disease usually greatly differ from it in the comparatively slight pain on attempted movement; there is also generally but little rigidity of the muscles and surprisingly little limitation of motion in proportion to the apparently advanced condition of disease in the joint; but here again collateral evidence of specific disease and the effect of iodides are often the most important points in the diagnosis.

Syphilis attacks certain joints much more often than others, and of these the knee seems to suffer almost more often than all the other joints put together; next in frequency is either the ankle or elbow-joint; then follow the shoulder, wrist, and some of the small joints; the hip seems to be very rarely affected.

Treatment.

With regard to the treatment, very little need be said, as it is merely that which is suitable to the particular stage of the primary disease at which the joint affection may occur. Usually, it is also best in the later secondary stages to give iodides in combination with mercury. It is also well, in a tertiary case which does not rapidly improve under iodides only, to give mercury in addition, but this is only what would naturally be done with any syphilitic lesion under similar conditions.

Absolute rest, as has been suggested above, is not only in many cases not absolutely necessary, but, if carried on for any length of time, is likely to do harm from the assistance that it gives to fixation of the joint. It may, however, be necessary for a time, in a case which is accompanied with a good deal of pain, and where the inflammatory process is very active until this active inflammation has passed off.

Counter-irritation is often very useful, especially if there should be much effusion. It may be applied in the milder form of painting with liquor iodi, or Scott's dressing, or more actively, as in the form of blistering, or if the pain seems deeply seated in the bones in the form of the actual cautery, while in the severest cases which are otherwise intractable trephining the bone in the vicinity of the joint may be resorted to.

In cases in which the disease in itself is quiescent the stiffness and limitation of movement may be much reduced by massage, and gradually increased passive movement with hot douching, and perhaps the use of hot-air baths, while actual deformity may be overcome by the usual means that are suitable in any particular joint affected.

BIBLIOGRAPHY.

- ¹ H. Marsh, *Diseases of the Joints*, 1895, p. 148. ² Richet, *Sur les Tumeurs*

Blanches, *Mém. de l'Acad. de Méd.*, 1853. ³ Zeissl, *Lehrbuch der Syphilis*, 1882, p. 530. ⁴ A. Fournier, *Leçons sur la Syphilis*, 20 and 21. ⁵ J. Voisin, *Contribution à l'Étude des Arthropathies Syphilitiques*, *Thèse de Paris*, 1875, No. 437. ⁶ Vaffier, *Du Rhumatisme Syphilitique*, Paris, 1875. ⁷ Pielicke, *Die syphilitische Gelenkerkrankungen*, *Bert. klin. Woch.*, 1885, Nos. 4 and 5. ⁸ Finger, *Zur Kenntniss die syph. Gelenk.*, *Wien. med. Woch.*, 1884. ⁹ A. Fournier, *Leçons sur la Syphilis*, 1880. ¹⁰ Lancereaux, *Traité de Syphilis*, 1873, p. 202. ¹¹ Sherrin, *BRITISH MEDICAL JOURNAL*, vol. 1, 1893, p. 254. ¹² Voisin, loc. cit. ¹³ Duffin, *Clin. Soc. Trans.*, vol. 11, 1869, p. 81. ¹⁴ H. Marsh, loc. cit. ¹⁵ Brochin, *Quelques mots sur les Tumeurs blanches Syphilitiques*, *Gaz. des Hôp.*, 1854, No. 39. ¹⁶ Richet, loc. cit. ¹⁷ Lancereaux, loc. cit. ¹⁸ Davies-Colley, *Syphilitic Erosion of the Bones of the Knee-Joint*, *Path. Soc. Trans.*, 1894, p. 132. ¹⁹ A. A. Bowlby, *Med. Chir. Trans.*, 1894, p. 43. ²⁰ R. Virchow, *Bert. klin. Woch.*, 1884, p. 534. ²¹ J. Parrot, *La Syphilis Héritaire*, Paris, 1886. ²² A. Fournier, *Syphilis Héritaire Tardive*, 1886. ²³ Imbert, *Gaz. des Hôp.*, 1899. ²⁴ Kirrison and Jacobson, *Rev. d'Orthop.*, 1897. ²⁵ Clutton, *Lancet*, vol. 1, 1886, p. 391. ²⁶ H. B. Robinson, *BRITISH MEDICAL JOURNAL*, 1896, vol. 1, p. 1191. ²⁷ H. Morestin, *Arch. Gén. de Méd.*, 1901, p. 101. ²⁸ J. Hutchinson, jun., *BRITISH MEDICAL JOURNAL*, 1892, vol. 1, p. 728. ²⁹ A. Fournier, loc. cit.

THE SPREAD OF ANKYLOSTOMIASIS.

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YOUR notes in the *BRITISH MEDICAL JOURNAL* of November 14th on the subject of ankylostomiasis are most opportune in drawing attention to the gravity of this pest. Few realize how enormous is the number of persons who are infested with this and other intestinal parasites, and in consequence how many soldiers and other persons who have resided in the tropics are likely to be infected and therefore become the means of spreading such disorders in Europe. When I became Inspector-General of Civil Hospitals in Bengal the subject soon attracted my serious attention. I found that in 1898, of all patients treated in the Bengal dispensaries 5.34 per cent. suffered from intestinal worms, and no fewer than 61.52 per cent. of these were in the Patna Division alone. In my report for 1902 on the Charitable Dispensaries of Bengal I find there were 274,595 such cases out of a total attendance of 4,452,628 individuals, or 6.16 per cent. In the Noakhali District the percentage was 21.88 and in the Durbhanga District it was 29.85. In Durbhanga town it was no less than 41.86, while in the fashionable hill station of Darjeeling it was 41.28 per cent.

Great as was the relief afforded by treatment of known cases of these affections it was clear that a large number escaped diagnosis, which could only be ensured in doubtful cases by microscopic examination of the faeces. I consulted Major Ronald Ross, who happened to be in Calcutta at the time, and in consultation with him Messrs. Baker and Company drew up a paper of instructions for issue with their plantation microscopes, which, at my instance have been or are being procured for most of the dispensaries in the province, and are used with excellent results. They are also supplied at the cost of Government, with the co-operation of the Inspector-General of Gaols, to all gaol hospitals in Bengal, and in these institutions much valuable information has been obtained by their use.

Recognizing that prevention was better than cure I requested Major Calvert, I.M.S., who, as Civil Surgeon of Durbhanga, had shown much zeal in the inquiry, to prepare a small pamphlet on intestinal worms for the use and guidance of hospital assistants, with the result that an excellent little work has been produced by him, and has been published by the Bengal Government. He states that in some districts in Bengal in 83 per cent. of the stools of the population the ova of the ankylostoma duodenale have been found. Twelve per cent. of the prisoners at Durbhanga had the ova of the tricocephalus dispar or whip worm and 9 per cent. the eggs of oxyuris vermicularis. In some districts 49 per cent. of adults and 75 per cent. of children suffer from ascaris lumbricoides. Major Calvert observes that "it might possibly be thought that the presence of a few intestinal worms, giving rise, as they sometimes do, to little inconvenience to their host, was not a matter of importance. As a matter of fact, this is not so. The people who harbour these parasites are the best judges of the inconvenience they cause; and from the numbers who now flock to the Bengal dispensaries to seek treatment which experience has taught them is effective and brings relief, it is evident that the presence of these worms is usually attended with considerable discomfort, if nothing worse." He does, however, point out that ankylostoma duodenale "do directly when in large numbers, and possibly indirectly when in smaller numbers, lead to the death of the host harbouring them." Moreover, we do not yet know whether the presence of such parasites is not a far more serious factor in the causation of inability to resist success-

fully the attacks of other diseases. Major Calvert goes on to show that there is very little difficulty, or even unpleasantness, in detecting the ova by the microscope. In Bengal those very useful persons the sweepers can easily be taught to carry out all the preliminary stages in the investigation. Most authorities recognize that success in abating the scourge can only be obtained by systematic and long-sustained efforts. It is easy to give immediate relief, but prevention in this case is much more important and difficult, and resolves itself into (1) treatment of infected persons so long as to ensure a complete cure; (2) destruction of faeces which contain the ova; (3) pure water supply; (4) conservancy; and (5), lastly, in my opinion, giving simple lessons in important sanitary matters in all schools, and even in colleges, because without the intelligent co-operation of all classes no effective sanitary reforms can ever be successfully carried out.

All of us are aware of the obstinacy of these affections, thus, for example, Dr. Ralph Stockman, in his paper which appeared in the *JOURNAL* of July 25th, remarked that the original worms in the case of ankylostoma die in about six years, and a natural cure then results. Fortunately, however, this period can be much shortened by appropriate treatment, and, in suggesting in Bengal, as I always did, that the stools of all prisoners should be examined on admission into gaol for ova, and treatment carried out until they were completely cured, I considered that not only would the individual be relieved but a large number of possible disseminators of the affection would, for at least a time, be rendered harmless. Moreover a man who is freed from this scourge is less likely to increase the gaol sick-rates and death-rates, because he is more likely to resist the usual gaol disorders. There can be no doubt that essential points in prevention are a pure water supply, improved conservancy (including destruction or disinfection of stools, which in public institutions is an easy matter), and habits of personal cleanliness, but, although it will be long before diseases of this kind are stamped out and the general population greatly influenced, a beginning can be made by educating the children and especially the people in right views on these subjects. In order to carry out these ideas I co-operated with the Director of Public Instruction in Bengal in inducing the Senate of the University of Calcutta to encourage training in elementary sanitary science and in hygiene by introducing the subject into examinations. Further effect was given to this decision by preference being accorded, all other things being equal, in appointing teachers under the Education Department and in accepting youths as engineering and medical students to those who had obtained the sanitary certificate of the University.

Moreover Major Bedford, I.M.S., has written a suitable manual on the subject for the use of students, in which special prominence has been given to native habits and modes of thought, points of much importance in order to remove many prejudices—religious, caste, superstitious, and otherwise. While all must be convinced of the extreme necessity of teaching the young why we should be clean, why spitting and other bad habits spread disease, or mosquito nets are desirable, and other simple matters of this kind, it is equally necessary to insist on such training being carried on into the higher branches of education so that teachers may be taught what to teach, and so that those who obtain high university degrees may be impressed with the importance of sanitary expenditure and legislation when they come to sit on municipal councils, and thus be led to aid, and not to oppose, such projects as they now sometimes do. My proposals to include in some way these important questions in the higher university training and tests met with some ridicule amongst the less informed native graduates, but they could hardly have realized the fact that, owing to the sanitary lapses, indifference, and ignorance of their poorer neighbours, even cultured citizens may run the risk of being eaten up of worms, as Herod of old was said to have been. The early environment of many rich and distinguished Orientals sometimes tends to make them indifferent to these serious matters, hence the necessity of so often calling attention to them. I believe that even in the case of plague many of the difficulties experienced in managing it would have been diminished by a more widely-spread knowledge of its causes and treatment, and that it is to a general spread of education in hygiene that the best hope lies for the future of mitigating such terrible diseases.

I have referred to the investigation of problems of this kind in gaols. No other places in India and in the tropics afford such excellent facilities for the study of many obscure problems in medicine and in hygiene. This is fully recognized by our best gaol medical officers, but unfortunately at present