appear to err on the liberal side, but the guardians, rightly or wrongly, hold the view that relief should be adequate to the needs of the applicant, and particularly in the case of children, who, well fed rather than half-starved, are much less likely later on to fall victims to sickness and be thrown again on local rates. This surely is an enlightened policy which is followed by the borough council in supplying dried milk free under a liberal wage scale to nursing mothers and young children, as well as by generous provision of convalescent treatment for ailing youth. Carping critics allege that relief schemes foster indifference and mendicancy. It may be so in isolated cases, and occasionally one meets with what at first sight appears to justify the criticism. For instance, my chief clerk, crossing the hall corridor, met a little vulgar boy. "Well, my little man, what do you want?" said he. "Please, sir, mother says will you put on a piece of paper what's given away?" His mother's request was not granted, but I fancy assistance followed investigation, and those who practically deal with relief know that the black sheep in every flock are few.

The Autocrat of the Breakfast Table said that no fresh truth ever got into a book, and I have merely been telling you what you know. With much you must agree; from some you may differ—a happy result if it lead to a stimulating discussion, for the man who proudly boasted that he had not had a disagreement with his wife for twenty-five years was promptly told by a sensible woman present that he had led a milk and water existence. In any case, whether I be charged with endeavouring to kill the slain or with setting up West Ham in rivalry with Epidauros and Cos, I care not; my good intention (not a paving stone, I trust, in this case) has been, in legal phraseology, to obtain a writ certiorari that while it is given to the few to achieve greatness and associate their names with some definite hygienic advance, each one of us, whether medical or lay, official, burgess, or representative (if we only have power to live up to our ideal), by lending our aid to wisely directed efforts to eradicate the social evils I have referred to, can definitely improve the public health of the community among whom we dwell and help on the world in its slow but sure journey to ultimate goodness.

In the stirring language of a recent writer to the *Times*, "The ideal is the only real and lasting fact of life, and a man's worth is conditioned by the effort he makes to attain it. He who has given up belief in the certitude of our manhood's perfection must sink back to the indignities of the man with the muck-rake, with eyes bent to earth, forfeiting the true wealth of reality for the glitter of things which leave their possessors in final beggary."

THE TREATMENT OF TUBERCULOUS DISEASES:

THE EFFICACY OF SODIUM MORRHUATE INJECTIONS COMPARED WITH OTHER TREATMENTS.

BY

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Of all the treatments used for the arrest or cure of tuberculous diseases, apart from or in conjunction with sanatorium treatment, that by means of injections of tuberculin or other chemical preparations has probably been most widely and often most successfully employed. Having had a fairly large experience, extending over nearly twenty years, of these methods, and finding that as time went on I was able steadily to improve upon my procedure, is my excuse for writing this paper.

TUBERCULINS.

Many will remember the time when, in 1890, Professor Robert Koch, somewhat against his own wish and before he had completed all his investigations and experiments, was forced by the Government to publish the outline of his new treatment by injections of a "lymph" which he called tuberculin, and which is still known and used under the name of O.T. or old tuberculin.

I have before me a pamphlet, published by the late Professor Anderson Stuart of the Sydney University in

1901, entitled *A Report to the Governments of New South Wales, South Australia, and New Zealand on the Koch Method of Treating Tuberculosis*. The report is interesting but disappointing as regards some of the results. We thought that at last a remedy had been found to exterminate this dread disease. People afflicted with it flocked to Germany from all parts of the world, full of hope, a few to return with their disease arrested, many never to return at all. A treatment which with all its failures could in some cases bring about such startling recoveries was so remarkable that it would have been surprising if it had been altogether shelved. Far from it. It is the foundation stone on which the whole structure of our modern tuberculin treatments has been built.

Some of the first books published on this subject by Camac Wilkinson (1908), Bandelier and Roepke (1911), Riviere and Morland (1912), and others, were all based on Koch's original discoveries. All these authors recommended treatment by Koch's method in a more or less modified form, by subcutaneous injections of various tuberculin in gradually increasing doses at intervals regulated by the resulting reactions (see Appendix A). Of patients treated by me by this method from 1905 onwards there are still a good many alive and well. In contrast to the milder treatment recommended by Sahli I shall call this Koch's treatment.

A few histories of patients with rather advanced disease will suffice.

Case 1.—1905. Mrs. G., aged 30 years, weight 41 kg.; ill five years; pronounced tuberculous family history. Both apices affected. Right lung, first stage (Turban's); left lung, second stage; frequent hæmorrhages and severe asthma. Sputum contained tubercle bacilli (Gaffky X). Disease arrested after two courses of tuberculin injections. Relapses in 1909 and 1920 easily remedied, the first by tuberculin, the last by sodium morrhuate injections. Weight 79 kg. All this time this patient lived in Sydney, which, on account of its warm and moist north-east winds in summer, is rather inimical to patients suffering from tuberculosis. Practically all the other patients whose history is given were treated under the same climatic conditions.

Case 2.—1909. Bro. J. M. Left apex, third stage. Tubercle bacilli in sputum (Gaffky X). Treatments with O.T., P.T.O., and P.T. Quite well to-day and sputum free from tubercle bacilli.

Case 3.—1909. Mr. L. L., aged 28 years. Urine contains pus and tubercle bacilli. Diagnosis: Tuberculosis of right kidney. One course of treatment with P.T.O., P.T., and T.B.E. injections. Apparently well. Urine quite clear. Relapse 1914. Treated with P.T.O. and P.T. injections. Quite well at present date. Looks picture of health.

Case 4.—Mrs. L. L., wife of last patient, was treated in 1910 for tuberculosis pulmonalis. Has had no recurrence since.

Case 5.—October, 1909. Mr. J. H., aged 36 years, weight 63.5 kg. Right apex, second stage. O.T. test positive. Ill twelve months. Diagnosis: Tuberculosis pulmonalis. Six months' treatment with T.B.E. and P.T. Well in May, 1910. Weight 73.5 kg. February, 1911, O.T. test negative. Quite well to-day.

Case 6.—February, 1912. Mrs. J. H., wife of previous patient. Aged 25 years; weight 52 kg. Right apex, second stage. O.T. test positive. Ill two months. Diagnosis: Tuberculosis pulmonalis. Eight months' treatment with T.B.E. Weight 59 kg. Well to-day.

Case 7.—February, 1912. A. H., daughter of the two previous patients, aged 10 years; weight 29 kg. Right apex, first stage. Von Pirquet test strongly positive. Ill six months. Three months' treatment with T.B.E. Well; weight 32 kg. August, 1916: O.T. test negative; weight 52.5 kg. Strong and well to-day.

Case 8.—February, 1916. Mr. J. J. S., aged 32 years, weight 57 kg. Right apex, third stage; left apex, first to second stage. Sputum contained tubercle bacilli (Gaffky X). Sent out from England as incurable. Seemed almost hopeless case. Diagnosis: Tuberculosis pulmonalis. After twelve months' treatment with P.T.O. and P.T. quite well; weight 62 kg. Has just returned from a trip to England well.

I could quote many other histories of patients treated many years ago who are still in good health. All I want to show is that by means of Koch's treatment it is possible to bring about more or less lasting arrest of advanced tuberculous disease. Still, in spite of all these successful results I was never quite satisfied, as in some cases, however small in number, Koch's treatment seemed to fail. Some patients did not improve at all, while others after an initial improvement seemed to relapse. Besides, it did not seem a suitable treatment for ambulatory cases, as patients sometimes during a severe reaction had to lay up for a day or two. On the whole patients afflicted with tuberculosis pulmonalis in all stages seemed to do better than so-called "surgical" cases—a term which I only use because up till

recent years many of these patients suffering from tuberculous gland, bone, joint, and skin (lupus) diseases had to be treated by surgical means, but most of whom, with our present knowledge, should have been cured by the physician long before surgical interference became necessary. (Cases 12, 13, 14, 15.)

When Sahli published his book on tuberculous treatment by means of very minute and slowly increasing doses of Béranek's tuberculin without reactions, I at once made use of it as it seemed to be somewhat safer and more reliable. (I shall call this Béranek's (T.Bk.) treatment (Appendix B).) As I anticipated, it proved to be so. Although the injections were painful for a few minutes the absence of big reactions alone made up for this slight inconvenience. In the early stages of tuberculosis of the lungs and in tuberculosis of the other organs of the body the results were far superior to Koch's treatment (Case 14). The improvement in these cases was steady and devoid of any sudden disappointments and relapses.

Case 9.—January, 1910. Mrs. G., aged 34 years, weight 45 kg. Right apex, third stage. Tubercle bacilli in sputum. Ill some time. Diagnosis: Tuberculosis pulmonalis. After six months' treatment with P.T. the disease apparently arrested. Sputum contained no tubercle bacilli. Relapse 1915. Twelve months' treatment with T.Bk. Quite well and strong to-day; weight 63.5 kg.

Case 10.—January, 1914. Mr. G. W., aged 20 years. Haematuria; urine contained pus and tubercle bacilli. Ill a few months. Diagnosis: Tuberculosis of the bladder. T.Bk. treatment. Well in 1914, when he went to the war and stayed at the front in France till the end. No relapse. Picture of health at present.

Case 11.—February, 1917. M., aged 31 years, weight 68 kg. Right apex, second stage. Larynx slightly affected. Sputum contained tubercle bacilli (Gaffky X) and streptococci. Four months' treatment with T.Bk. Apparently well; sputum free from tubercle bacilli. Went to the islands. Weight 83 kg. This patient took, apart from other meals, about two dozen raw eggs each day, which may account for big increase in weight.

Case 12.—1913. D. T., aged 15, suffering from tuberculous hygroma of right knee. Complete cure after six months' treatment with T.Bk.

Case 13.—1913. E. T., aged 19, sister of Case 12, suffering from tuberculosis of right hip-joint. Had been operated on a few months before. When first seen by me there were many suppurating sinuses and a temperature of 38.3° C. During the first two months of T.Bk. treatment the temperature rarely dropped below 37.8° C. Treatment lasted twelve months, with the result that the temperature gradually became normal, the sinuses healed up, and the patient could walk about with the aid of a walking-stick. When last heard of about twelve months ago she was employed as a domestic servant.

Case 14.—1917. Miss F., aged 16 years. A remarkable case showing the superiority of T.Bk. over Koch's treatment. Some years ago she had pleurisy and peritonitis (tuberculous). Six months ago she developed tuberculosis of the left ankle and right knee joints, for which she was being treated by a specialist with tuberculin injections with very severe reactions. Another physician, visiting another patient at the same boarding-house in which my patient was living, told her mother that in his opinion her daughter could only live another week or two. When called in I found the patient in a deplorable condition: as thin almost as a skeleton, her left ankle had a large unopened abscess, her right knee the size of a small football fixed at an angle of 90 degrees. After having the abscess opened, and without using any splints, I started at once T.Bk. treatment, with the result that in eight months' time the right knee was normal, while the left ankle was stiff but quite movable after an operation under anaesthesia for breaking down some adhesions. Six months after her return from the country she came to see me quite well.

Case 15.—One of my first cases treated with T.Bk. at the Anti-tuberculosis Dispensary is worthy of notice. I cannot get the history chart of this patient—a boy about 18 years old, who had had two amputations already, the first an amputation at the ankle-joint for tuberculosis of the bones of the foot, and the second at the junction of the lower third and upper two-thirds of the leg for tuberculous bone trouble. When seen by me he had several tuberculous sinuses, and had been advised to have the leg amputated at the knee. About twelve T.Bk. injections healed every sinus up.

Case 16.—1917. Mrs. G., aged 33 years, weight 51 kg. Ill twelve months. Sputum contained tubercle bacilli (Gaffky IV). Right apex affected to sixth rib. Diagnosis: Tuberculosis pulmonalis. Quite well after one course of T.Bk. injections with disappearance of tubercle bacilli. Two years later came to Sydney from her country residence, caught "a cold." During a severe coughing fit expectorated pieces of "marble" and a fair amount of blood. The sputum examination two days later contained many tubercle bacilli. Two months' T.Bk. treatment resulted in the disappearance of the organisms, and patient left for her home a couple of months later. Splendid health since. Weight 73 kg.

Here is a patient in the best of health suddenly having a relapse with sputum containing many tubercle bacilli, and quite well again in a few months' time. The organisms must have been encapsuled in the lung, and probably being

attenuated could easily be got rid of. Hence it is always better to speak of "arrest" rather than "cure" in these cases.

Even these few histories will show how valuable a remedy Béranek's treatment is, and I would still be using it if it had not been for the fact that the treatment presently to be described can not only bring about results equal to Koch's or T.Bk. treatment, but can succeed even where either of these treatments may have failed.

It is sometimes very difficult to convince some practitioners that there may be faults in their treatment. If anything goes wrong they are quite satisfied that it is *post hoc*, never *propter hoc*. The worst is that they are absolutely sincere in their belief. The Koch enthusiasts will never admit that if a patient does not improve it may be their own fault, and the same applies to those who use T.Bk. treatment. All the same, either method has its pitfalls. Is there any explanation?

We are under a great debt of gratitude to Sir Almroth Wright for the elucidation of many obscure points in vaccine treatment. He has demonstrated a certain definite sequence of changes in the opsonic action after the injection of vaccines. Following such an injection there is induced a phase in which the protective substances in the blood (opsonins, agglutinins, etc.) are diminished—the so-called negative phase. This is followed after a shorter or longer period of time, according to the size of the injection, by a rise in the amount of protective substances—the so-called positive phase. A dose, even if quite correct otherwise, given during the negative phase will depress the patient still more, while too large a dose given during the positive phase may sometimes undo all the good derived from the first dose. A right dose at the wrong time or a wrong dose at the right time may have equally disastrous results—with this difference as regards T.Bk. or Koch's treatment, that in the former case (the dose being so much smaller and the increases much more gradual) it may take several doses before we become aware that we are on the wrong tack; while in the latter there is seldom much doubt about it. It is merely a matter of degree. In T.Bk. treatment of tuberculous glands, for instance, the results are mostly extremely gratifying, but sometimes it may happen that instead of improving the glands may even get larger. We know then that the doses were either too large or given at the wrong time, and it may take many weeks of treatment to rectify our mistake provided it is not too late. In Koch's treatment, especially after a well marked reaction, we can usually tell if the dose was correct or not. The patient's statements, "Feel so splendid," "Never felt better in my life," tell their own tale. But after the next dose, even if chosen with scrupulous care, the patient may tell you, "Doctor, I think I have caught a slight cold." You examine him and find his lung condition worse. Has the dose had nothing to do with it? Mistakes of this kind are difficult to guard against. Only experience will enable us to avoid these blunders most of the time, but not always.

A treatment which may be harmful in even one case out of fifty is, to say the least, to be handled very carefully. I would like to say here a few words about Koch's tuberculin test. In giving it we are working absolutely in the dark. In giving these large, rapidly increasing doses of O.T. it would be surprising after what I have said if it did not do any harm occasionally; I can distinctly remember one or two patients in whom it seemed to have greatly lessened their chances of recovery. With so many other diagnostic means at our disposal it should not be necessary. After all, this test is only absolutely trustworthy if it is negative. Some years ago, whenever I intended using the O.T. test I applied a von Pirquet's test a few days before the actual O.T. test injections. By comparing the two results I can now get the same clue from a von Pirquet test as I did formerly from the O.T. test, and without any risk to the patient. The scope of this paper will not allow me to explain this further.

T.Bk. treatment has proved itself in my experience more effective in the early stages of pulmonary tuberculosis and in tuberculous diseases of other organs because, absorption of toxin often being almost absent or deficient, small doses

of tuberculin would be sufficient to set the immunization process going; on the other hand, in advanced phthisis pulmonalis, where the whole system is, so to speak, already saturated with toxin, a small dose of tuberculin would be only like a drop in the ocean. It is in these latter patients that Koch's treatment with large doses of tuberculin often gives such marvellous results, provided always the reactions following on an injection are favourable and create sufficient antibacterial substances to lessen the vitality of and finally destroy the germs.

Tuberculin treatment, especially Koch's, is a double-edged weapon which should only be handled by men with experience. Such a treatment, in which so much depends on the reactive powers of the patient, and which, if used carelessly, may sometimes have most deplorable results (Case 14), or which, even if used with the greatest care, may occasionally fail to effect improvement, or which (especially if very large doses are used) may greatly lessen the chances of recovery, is one not lightly to be undertaken.

I shall pass over treatment by tuberculin insufflation and inunction (provided the tuberculin becomes absorbed through the skin) as unscientific, because it would be impossible to regulate the doses, and the risk to the patient may be even greater still.

SODIUM MORRHUATE.

In the issue of the *BRITISH MEDICAL JOURNAL* of February 8th, 1919, Sir Leonard Rogers published a short article on the treatment of tuberculosis by subcutaneous intramuscular, or intravenous injections of the sodium salts of the unsaturated fatty acids of cod-liver oil after extraction by ether, which he called sodium morrhuate.

We all know the value of cod-liver oil by mouth in patients suffering from tuberculosis. What at once appealed to me most in connexion with this new discovery was the fact that, if successful, the effect of it would not have to depend so much on the reactive powers of a patient, but that it would act directly (as Sir Leonard Rogers suggests) by dissolving the coating of these acid-fast bacilli and thus laying them open to destruction.

Having started this new treatment from the middle of 1919, and having used it since almost exclusively, I am so much impressed with the results obtained, superior in every way to the other methods (Cases 18, 19, 27) used by me in the past, that I would not even withhold it from an almost dying patient.

Case 17.—November, 1920. Mrs. C., aged 41 years, weight 40.5 kg. Ill nine years. Almost bedridden during the last nine months, with night-sweats, temperature up to 38.3° to 38.9° C. almost every day, and frequent haemorrhages. When first seen her temperature was 38.3° C. Large amount of purulent expectoration containing tubercle bacilli (Gaffky VI). Left lung extensively affected with a cavity. Systolic blood pressure 110 (very faint). Diagnosis: Tuberculosis pulmonalis. During the first two months of sodium morrhuate treatment the temperature gradually came down, and in July, 1921, was normal. Treatment lasted about twelve months, at the end of which time cough very slight, sputum free from tubercle bacilli, and systolic pressure 140. She then left for the country. At the time I started the sodium morrhuate treatment I had several patients who, though improved under T.Bk. treatment, did not progress beyond a certain stage. With sodium morrhuate the change for the better was almost startling. Besides, in two patients, after sodium morrhuate had brought about an arrest of the disease, another very small dose of T.Bk.—about 0.001 mg. (given with the view of further immunization)—brought on an immediate relapse, which on resuming the sodium morrhuate injections was again easily arrested.

Case 18.—July, 1916. Mrs. H., aged 33 years, weight 50 kg. Ill (so she told me) twenty-two years. Had tuberculin treatment in America, with only slight improvement. Arrived in Australia in 1914 much worse. Here she had two years' tuberculin treatment at a hospital. No better. Seen first by me in 1916. Her condition looked almost hopeless. Right apex, active disease affecting the whole of the upper lobe with cavity formation. Frequent high temperatures and haemorrhages. Sputum contained tubercle bacilli (Gaffky X). Diagnosis: Tuberculosis pulmonalis. As she was so ill I did not like to use Koch's treatment; I therefore gave her T.Bk. injections, with slight improvement only until 1919, when the sputum still contained many tubercle bacilli. In July, 1919, I started combined T.Bk. and sodium morrhuate treatment by giving alternate doses of each. Still further improvement. Next course, October, 1920, sodium morrhuate. Result: Within six months disappearance of all active symptoms and absence of tubercle bacilli from sputum. I then gave a small dose of T.Bk. for the reason above stated; this was followed immediately by a relapse. After three more months of sodium morrhuate treatment the patient was discharged with the disease arrested; no sputum; weight 63.5 kg.

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I have seen this patient on several occasions since, the last time about a week ago, and she still seems to be in perfect health. During all this time the patient lived in Sydney doing her own housework.

Case 19.—A very similar case to the last one is that of Mrs. C., who came to me suffering from tuberculosis pulmonalis a few years ago. While T.Bk. treatment brought about only a slight improvement, treatment by sodium morrhuate was followed by a complete arrest of the disease. This patient, like the last, relapsed after receiving a small dose of T.Bk. She is quite well now. Her two boys, suffering from tuberculous adenitis, are also in good health after treatment by sodium morrhuate.

The next two histories will show how sodium morrhuate treatment can bring about an arrest of tuberculous disease even after sanatorium treatment has failed.

Case 20.—November, 1921. Mr. S. M., aged 37 years, weight 75 kg. (height 6 ft. 1 in.). Ill six months. Had three months' sanatorium treatment without any improvement. Then went to the New England district (well known for its dry and bracing climate) for some months. Slight increase in weight, but as the weakness, cough, and frequent haemorrhages did not improve, he came to Sydney for further advice. Right apex, second to third stage. Sputum contained tubercle bacilli (Gaffky V). Started sodium morrhuate treatment in May, 1922. In August, 1922, haemorrhages had practically ceased and sputum became clear of tubercle bacilli; weight 82.3 kg. I may mention that two to three weeks after commencing treatment he resumed his work as a commercial traveller, and has continued it without a break up to date. Feels and looks well.

Case 21.—April, 1921. Mr. A. C., aged 33 years, weight 63 kg. Ill twelve months. After three months' sanatorium treatment with no improvement came to me complaining of almost daily haemorrhages, cough, expectoration, weakness, etc. Right apex, third stage. Sputum contained tubercle bacilli (Gaffky X) and streptococci. Diagnosis: Tuberculosis pulmonalis. After eight months' treatment with sodium morrhuate the sputum was free from tubercle bacilli; no more haemorrhages; weight 71.5 kg. July, 1922, no cough; feels splendid. No relapse since. This patient got better under the worst possible conditions. During the treatment he lived in a very unhygienic suburb with his wife and four children in very poor circumstances.

Case 22.—May, 1920. Bro. C., aged 42 years, weight 62.6 kg. Suffered from frequent attacks of "sore throat" for the last fourteen years; much worse the last six months with absolute loss of voice. Right apex, second stage. Cavity. Larynx, both vocal cords infiltrated with tubercle formation. Both aryepiglottic folds swollen and ulcerated. Sputum swarming with tubercle bacilli (I do not remember a worse specimen). Diagnosis: Pulmonary and laryngeal tuberculosis. After two months' sodium morrhuate treatment (in Sydney) sputum free from tubercle bacilli. Two subsequent sputum examinations gave the same result. After four months' treatment weight 70.5 kg.; well; lung fibrosed and larynx healed up. As both vocal cords had been practically destroyed his voice will always be affected.

Case 23.—April, 1922. M. M., aged 1½ years, weight 34 kg.; aboriginal girl from one of the Pacific islands. Very bad family history. Ill twelve months. Right apex, third stage. Large gland (size of a large pigeon egg) in front of right sterno-mastoid. Sputum contained tubercle bacilli (Gaffky VI) and streptococci. Diagnosis: Tuberculosis pulmonalis. Sodium morrhuate treatment. To-day gland disappeared; no lung symptoms except some dullness and tubular breathing at former site of disease. As expectoration has ceased, cannot examine sputum. No cough; weight 43.5 kg. I give this history as there were two special drawbacks: (1) Coloured people if infected with the germs of tuberculosis are the worst patients for treatment; (2) it is most difficult to improve children if they once develop tuberculosis of the lungs. In spite of this, this little patient got better. If improvement will be permanent I cannot say.

Case 24.—August, 1920. R. W., aged 26 years, weight 75.5 kg. (height 6 ft. 2 in.). Good health up to three years ago, when he became incapacitated at the front in France. Right apex, second stage. Sputum contained tubercle bacilli (Gaffky II). Had two courses of sodium morrhuate treatment. To-day feels fine; weight 80 kg.

Case 25.—May, 1911. E. R., aged 25 years. O.T. test positive. Diagnosis: Tuberculosis pulmonalis. After a course of Koch's treatment, well in December, 1911. O.T. test still negative in October, 1912. Went to the war. Came to me in July, 1920, with right lung second stage. After five months' sodium morrhuate treatment, well.

Case 26.—November, 1920. Mrs. K., aged 60 years, weight 46.8 kg. Systolic blood pressure 160. Several extremely large cervical glands at the root of the neck (both sides). Ill some time. Had been told that she had cancer, and advised to have it removed by operation. Von Pirquet test strongly positive. Diagnosis: Tuberculosis adenitis. Seven months' sodium morrhuate treatment brought about complete disappearance of these glands. Weight (July, 1921) 53 kg., (July, 1922) 60.7 kg. September, 1922, small gland left side. Advised further treatment.

Case 27.—July, 1922. D. D., aged 45 years. Short time before coming to me had several tuberculous glands removed from the right axilla. Large swelling of right wrist and carpal bones. After about fifteen tuberculin injections at a hospital, much worse. Diagnosis: Tuberculosis of wrist-joint and carpal bones of right hand. After three months of treatment by sodium morrhuate he was

well. Patient, who owned a small mine in which he with others had been working (pick and shovel work), went back to work. Came to see me about a month ago for another complaint (a large burn). His hand was still quite right and gave him no trouble.

I have picked out these last two histories to show the value of sodium morrhuate treatment in these (so-called) surgical cases, even after tuberculin treatment had failed (Case 28).

Case 28.—January, 1920. Sister M. G., aged 37 years, weight 56 kg. Ill eight months after pneumonic influenza. Whole lower lobe of left lung still dull; crepitations, etc. Sputum contained tubercle bacilli (Gaffky II). After eight months' treatment with sodium morrhuate all the physical signs had disappeared. Feeling well; weight 58 kg.

There were numerous patients in the earlier stages of the disease who recovered without much trouble under sodium morrhuate treatment. I have specially selected these case histories with a view of showing—

1. How valuable a remedy sodium morrhuate treatment is, even in very advanced stages of all kinds of tuberculous trouble.

2. That sodium morrhuate treatment not only gives results equal to those achieved by tuberculin treatments, but it can arrest tuberculous diseases even where previous tuberculin or sanatorium treatments have failed.

3. That given in correct doses without reactions it neither inconveniences a patient, as is often the case with Koch's treatment, nor are the injections as painful as in T.Bk. treatment. It is therefore the best method in ambulatory cases.

4. That it is the only reliable remedy in haemorrhagic or feverish patients.

5. That it is a safe remedy if used correctly, and free from those surprises sometimes following a tuberculin injection.

One strange effect as regards sodium morrhuate injections happened so frequently that I cannot consider it as a mere coincidence. We all know that tuberculin injections, given even in fairly large doses to patients either free from active tuberculosis or in the last stages of the disease, often do not cause any local reaction. (The O.T. test is based on this fact.) The same almost invariably occurs in sodium morrhuate treatment. On several occasions when patients urged me to give them a second course of sodium morrhuate treatment after an interval of about six months, when all previous clinical as well as physical symptoms had disappeared, sodium morrhuate could be given in steadily increasing doses up to 1 c.cm. or more without any local reactions. The same happened in several patients with advanced tuberculosis. By local reactions following sodium morrhuate injections I mean a local redness of the skin around the site of the injection up to the size of half a crown; different from a severe local reaction following an O.T. injection, which sometimes resembles a severe attack of erysipelas. On the other hand, even in the earliest stage of active disease, it is sometimes very difficult to work up to a 1 c.cm. injection of sodium morrhuate without reactions (thus resembling the high sensitiveness of tuberculous patients to small doses of tuberculin). Mr. M. is a case in point.

Case 29.—Mr. M., aged 37, weight 65.5 kg., came to me on account of his bad family history just after I had commenced sodium morrhuate treatment. He felt fairly strong in spite of having to do rather strenuous work. Slight cough, no physical or other clinical symptoms. X-ray negative. Von Pirquet test positive. Diagnosis of active tuberculosis doubtful. As he urged me to give him a course of injections as a precaution, I did so. During four months' treatment I could not give him a single injection of sodium morrhuate without a more or less severe reaction, and only succeeded in increasing the dose to 0.5 c.cm. As he felt well I discontinued the treatment; weight the same. A month ago he came back to me, looking pale, rather weak, slight cough and some catarrh. Some faint crepitations at right apex. Von Pirquet test strongly positive, making the diagnosis of pulmonary tuberculosis almost certain. I have just started sodium morrhuate treatment again and am going to work up to a bigger dose this time if possible.

This and other cases I could quote tend to show that local reactions following sodium morrhuate injections are almost specific.

After using sodium morrhuate treatment now for about

four years I feel so convinced of its efficacy, of its superiority over other treatments, and of its comparative harmlessness, that should a patient (in whom the prognosis was still favourable) fail to improve or to retrogress, I would seriously doubt—

- (1) If the diagnosis has been right. We all know how syphilis, for instance, can closely imitate tuberculosis of the lungs.

- (2) If the patient has followed my instructions. One patient used to celebrate each injection by an extra indulgence in alcohol.

- (3) If there are any complications—pneumococcal or streptococcal infections, syphilis, etc. One patient only began to improve after expelling the largest tapeworm I have ever seen.

- (4) If the sodium morrhuate was up to standard.

Case 30.—Mrs. B., aged 41 years, weight 50.5 kg. Suffering from advanced pulmonary and laryngeal tuberculosis. Tubercle bacilli present (Gaffky X). Improved steadily under sodium morrhuate treatment until about six months ago, when my fresh supply of sodium morrhuate ran out. While giving slightly cloudy solutions of sodium morrhuate she went steadily back. On resuming solutions which were perfect she at once improved again, and is now on a fair road to recovery. Weight now 64 kg.

It used to puzzle me why this treatment had not been extensively used before. Apart from the slight trouble in making up the solutions and sterilizing them in an autoclave, my greatest difficulty has been that I could not procure the sodium morrhuate powder absolutely fresh for a time. Instead of a light yellow dry powder it frequently arrived slightly moist only, or as a sticky brownish mass. The powder probably deteriorated in transit. This difficulty has now been overcome. Unless the sodium morrhuate is in a good condition and the solution prepared with it perfectly clear, it should be discarded. Unless the drug is perfect the results of this treatment are negative. I feel inclined to think that this is the reason for negative results obtained by others (see Appendix C).

In conclusion I can only say that after using the various tuberculins, serum (Marmorek's), different colloidal preparations, sugar injections, etc., sodium morrhuate alone has given me the most uniformly successful results. It can be used with confidence and without fear of any unpleasant results.

I sincerely hope that this short review may induce medical practitioners to give this treatment a more extensive trial, and I feel sure that they—and what is more important, their patients—will not be disappointed. The medical profession should be grateful to Sir Leonard Rogers for placing such a valuable remedy at its disposal.

APPENDIX A.

Koch's Treatment.—Tuberculins used were T.O.A., O.T., P.T.O., P.T., T.B.E., P.B.E., and T.R. Solutions were made with sterile distilled water to which 0.5 per cent. carbolic acid had been added and prepared on a decimal system and labelled A (pure tuberculin) to E, 1 c.cm. of which contains 0.0001 gram (pure tuberculin). Smallest starting dose usually 0.0001 to 0.0001 gram, and gradually increased according to reactions to 1 c.cm. of the pure tuberculins, and to 3-4 c.cm. of the pure emulsions—the latter only in a few cases.

Increases on a logarithmic scale. For instance, start with 0.1 c.cm. of solution D, then 0.15 c.cm., 0.22 c.cm., 0.32 c.cm., 0.46 c.cm., 0.68 c.cm., 1 c.cm., followed by 0.15 c.cm. of solution C, etc.

Intervals between doses were regulated by reactions and the general condition of the patient. If there was no reaction and the patient was improving, doses were given every three to four days. If reactions, intervals were lengthened to a week, two weeks, sometimes three weeks, when the same dose or a slightly smaller one was repeated.

APPENDIX B.

Béraneck's Treatment.—At first Béraneck's tuberculin was used according to Sahli's method, by making each solution twice as strong as the preceding one. Later the decimal system of dilution was adopted.

From solution A (=pure tuberculin) to G, 1 c.cm. of which contains 0.001 mg. of pure tuberculin. Starting doses in children usually 0.1 c.cm. of G. In grown-up people usually 0.1 c.cm. of F, and slowly increased till solution E or D was employed. I do not remember ever using solutions B and C.

Increases of doses: 0.1 c.cm., 0.13 c.cm., 0.18 c.cm., 0.24 c.cm., 0.32 c.cm., 0.42 c.cm., 0.56 c.cm., 0.75 c.cm., 1 c.cm. As reactions were, if possible, avoided, injections were usually given at intervals of about three to four days.

APPENDIX C.

Sodium Morrhuate Treatment.—Three per cent. solutions, to which 0.5 per cent. carbolic acid had been added, were used after sterilization in an autoclave. Solutions, which should be clear or become clear on reheating, were made up fresh once or twice a week. In a few children doses were diluted by one-half.

Starting doses for subcutaneous or intramuscular injections were 0.1 c.cm. to 0.2 c.cm., and increased by 0.1 c.cm. (provided no reaction followed, when the dose was either repeated or lessened), to 1 c.cm. or a little more. At intervals of three to five days. The larger dose was usually repeated at intervals of six to seven days.

Intravenous injections up to 3 and 4 c.cm. in a few cases did not seem to give any better results than the repetition of 1 c.cm. doses.

NOTE ON DR. BOELKE'S METHOD OF USING SODIUM MORRHUATE IN TUBERCULOSIS.

BY

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I AM indebted to Dr. P. W. R. Boelke for kindly sending me a copy of her paper, and regard both the method of administration and the results obtained as of great importance for the following reasons. The first trials of sodium morrhuate reported by me in 1919¹ established its specific action on tuberculous disease, as shown by febrile reactions with swelling of tuberculous glands, increased discharge from tuberculous sinuses, and occasionally haemoptysis in lung cases; all effects that may be followed by improvement. Recently I discussed the probable mode of action of the drug.² Dr. Boelke's interesting observation of local reactions at the site of subcutaneous injections of the drug in tuberculous cases confirms its specific action on this disease. General reactions may, however, be excessive, for during the past year cases of spread of the disease in the lung, of fresh patches of tuberculous dermatitis, and in one case of apparent generalized tubercle, have followed the use of intravenous doses; so the drug, like tuberculin, is capable of doing harm, and this necessitates great caution in its use, although the very fact that it exerts such definite influence on tuberculous tissues indicates that it may have a beneficial action, if this can only be kept within safe limits.

It is precisely in this direction that promise is afforded by Dr. Boelke's plan of giving small subcutaneous doses of freshly prepared solutions—a point I believe to be of great importance—such doses as do not produce local reactions at the site of injection, which appears in her hands to have eliminated the dangerous general reactions sometimes following the larger intravenous doses formerly advised by me on the basis of their effectiveness against the much less toxic acid-fast bacillus of leprosy. The new method of administration, if confirmed by trials now being carried out by experts in this and other countries, may furnish a safe, simple, and exceedingly cheap method of treating at least a fair proportion of tuberculous cases, although prolonged observations will be necessary before the precise indications for its use can be worked out.

REFERENCES.

¹ BRITISH MEDICAL JOURNAL, 1919, i, 147; *Indian Journ. Med. Research*, 1919, p. 236. ² BRITISH MEDICAL JOURNAL, 1923, ii, 11.

A NOTE ON THE TREATMENT OF LEPROSY.

BY

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THE treatment of leprosy by colloidal antimony has been advocated and oscol stibium (Oppenheimer) has been given a trial in the Isolation Hospital at Baghdad. Our experience may be interesting to others. The trial extended over a period of nine months, but patients were usually treated with this preparation for about three months, and the results are compared with those from the intravenous injection of a mixture of chaulmoogra oil and ether in the same patients. Fifteen cases were treated, in all of whom the diagnosis was confirmed bacteriologically. All the cases were severe and were unable to work. The types were nodular, macular, and anaesthetic,

in combination in varying proportions, with tissue destruction in varying stages. In a few cases leprotic fever was present.

The treatment was by weekly intramuscular injection, starting with 1 c.cm. and increasing in the absence of severe reaction to 5 c.cm., which was the maximum dose used. The total amounts injected varied from 9 c.cm. to 146 c.cm., the average being 51 c.cm. The observations ceased on April 17th, 1923, as for economy these cases had to be discharged from hospital.

The treatment could not be persisted with in cases of leprotic fever owing to severe reaction (fever and focal inflammation). In all other cases no contraindication was found. The usual reaction was 1° or 2° of fever during the twenty-four hours following the injection and slight malaise; in some cases the reaction was more severe, and in these one or two injections were omitted and the treatment continued with lower doses. In most cases focal reaction occurred as inflammation of the nodular masses and itching of the affected skin.

In most cases following the reaction a feeling of increased well-being immediately supervened, so that the injections were popular. The general results were: distinct improvement, sensations returning to anaesthetic patches, hair returning where it had fallen out, thickening of the skin and wrinkling reduced. The nodular masses, however, did not disappear in the majority of cases, and leprosy bacilli did not usually disappear from the nasal mucus. The effect of more prolonged treatment is unknown.

After about three months the cases seemed to come to a standstill, and then treatment by chaulmoogra oil and ether was tried. The mixture used was chaulmoogra oil 75 parts, ether 24 parts, and carbolic acid 1 part. Of this weekly intravenous injections were given, starting with 5 c.cm. and increasing up to 30 c.cm. The immediate reaction is severe, particularly if the larynx is affected. A feeling of suffocation occurs, which, however, passes off quickly. This effect is caused by the ether in the injection. Similar focal reactions and beneficial effects followed this treatment to those with oscol stibium. The intramuscular injection of the latter with its delayed reaction is, however, more suited to out-patient treatment. Also the leprous infiltration of the skin makes intravenous injections difficult in some cases. The amounts of chaulmoogra mixture injected varied from 60 to 630 minims, and averaged 278 minims in 11 cases treated for an average period of two and a half months. After a period of about three months these cases also came to a standstill. Some interesting observations were made. In some cases the return of sensation by treatment was only temporary. One case while under treatment developed a fresh heavy crop of nodules on hands and arms. In another case the disease was apparently aggravated by the antimony injections as fresh eruptions and leprotic fever followed a few injections of only 1 c.cm. weekly, and the drug had to be stopped. Occasional cases, however, do very well, such as the following:

Admitted on June 9th, 1922, with granulomata on various parts of the skin of the chest and scrotum; tongue and pharynx ulcerated. Loss of hair; ulnar nerves thickened; loss of sensation complete in arms and near rash on chest. Smears from nodules and from nasal mucus showed leprosy bacilli present in large numbers. Injections of oscol stibium commenced on July 13th, 1922. On July 16th, nodules still positive to leprosy bacilli, but nose negative. No change in nodules and in hair, but sensation returning and patient feeling stronger and more cheerful. On October 4th, after 61½ c.cm. of oscol stibium, the treatment was changed to chaulmoogra oil, and from November 9th, 1922, to February 3rd, 1923, 630 minims were given. The nodules now began to disappear and hair began to return on eyebrows. From February 3rd to April 17th oscol stibium was resumed, and 85 c.cm. given. On April 17th he was discharged from the wards but engaged in the hospital as a sweeper as he was physically fit for such work. He is continuing oscol stibium treatment as an out-patient. Already the diminution of the nodosities and of the infiltration of the skin is very marked. This was our best case.

It is obvious that in advanced cases with these medications prolonged treatment will be necessary to effect great benefit. We have still to search for a more specific treatment. For the treatment of leprosy we must now look