From this time onwards the findings became less pathological, and when the cerebro-spinal fluid was examined at the end of February, 1920, it was found to be perfectly normal.

This, of course, was a case of meningitis with involvement of both vestibular and cochlear branches of the auditory nerve. From the first drainage the physical signs improved enormously, and, when examined fourteen days after the last, the headache, deafness, and nystagmus had entirely disappeared. The tinnitus aurium, however, persisted, as always happens in this type of case. The rise in the cell count after the first tapping is worth noting, as it was almost a constant phenomenon, especially in cases of meningitis.

CASE II.

A man, aged 34, developed a papulo-erosive chancre on the fraenum in 1917. When seen in February, 1920, he complained of intolerable headache and almost complete loss of memory for recent events. He had had two epileptic fits in the previous month. Clinical examination revealed nothing abnormal except that the deep reflexes were rather exaggerated. His cerebro-spinal fluid was examined on February 2nd and 3rd, 1920, and again on March 27th, 1921. The results are shown in the following table:

	Feb. 2, 1920.	Feb. 23, 1920.	Mar. 27, 1921.
Cells	100	154	3
Globulin	+	doubtful	—
Wassermann	++	doubtful	—
Gold sol	001234444	011332111	000000000

Treatment extended from February 2nd to April 27th, 1920. The patient's symptoms rapidly cleared up. He continued on mercury and potassium iodide, and, when seen a year later, looked in robust health. He complained of nothing, and had had no more fits. His cerebro-spinal fluid was again examined and, as will be seen by the table, was found to be perfectly normal.

CASE III.

A man, aged 50, developed a papulo-erosive chancre on the glans penis in 1891. He was treated with mercury for four months after infection, but had had no treatment since. When seen on September 20th, 1921, he stated that he had suffered from lightning pains in his legs for the last eighteen years, and from urinary incontinence for over five years. His physical signs were those typical of a case of tabes, and in addition he wore a portable urinal. An examination of cerebro-spinal fluid on September 20th, 1921, gave the following results: Cells 22, globulin test positive, Wassermann reaction strongly positive, gold sol 012441000.

Treatment was at once instituted, and, although it is now only two months since it was started, the patient's general condition has already vastly improved. The lightning pains have entirely disappeared, and, although he still has some frequency of micturition, his bladder trouble is very much better, and he has given up his portable urinal. There is no alteration, however, in the cerebro-spinal fluid picture, and when this was examined, on November 16th, 1921, it was practically the same as on September 20th. He still, of course, shows the same physical signs as before, but from his point of view his life is now worth living, and he can pass water almost like a normal man instead of having to let it dribble into a urinal all day long.

CASE IV.

A man, aged 46, developed a papulo-erosive chancre on the glans penis in 1901, and was treated with mercury for eighteen months. When seen on April 6th, 1921, he showed the usual physical signs of tabes plus a greatly enlarged Charcot's left knee-joint, which had appeared after a kick from a horse in France in 1917, and for which he wore a special walking apparatus. He complained of lightning pains and headache, and could not exactly remember when they started. His first course of treatment extended from April 6th to June 1st, 1921. His cerebro-spinal fluid was examined on both of these dates, with the following results:

	April 6.	June 1.
Cells	67	36
Globulin	+	+
Wassermann reaction	++	++
Gold sold	234455210	122211100

By this time the lightning pains had greatly improved, but the most interesting thing of all was that the Charcot joint was now half its former size, the whole of the redundant synovial fluid having been absorbed. The expensive apparatus which he was wearing was now much too big for him, and he had to discard it. In August, 1921, he began to suffer from headaches again, so he was given a further course of treatment, which resulted in the disappearance of this symptom. At the present time he is free from symptoms, and the effusion in the Charcot's joint has not recurred. His cerebro-spinal fluid picture is still much the same as when treatment was first started.

CASE V.

A man, aged 36, developed a papulo-erosive chancre on the coronal sulcus in 1911, and was treated in Italy for three and a half years with weekly intramuscular injections of mercury (with occasional rests) and potassium iodide by the mouth. He remained perfectly well until the beginning of 1920. At this time he began to neglect his work, and his friends and relatives noticed that he was getting slovenly and neglectful in his habits and appearance. These symptoms gradually progressed, and he was given a long holiday by his firm with instructions to "pull himself together." On June 29th, 1920, he presented himself at hospital. He talked volubly with a markedly sturring speech, the tendon reflexes were

exaggerated, and the pupils sluggish and irregular. It seemed obvious that he had developed general paralysis, and this opinion was confirmed by an examination of the cerebro-spinal fluid, which gave the following result: Cells 55, globulin and Wassermann tests both strongly positive, gold sol 5555554342.

He was treated from June 29th to August 10th, 1920, with the result that his mental condition considerably improved. He was given another course in November and December, 1920, and it is worth noting that the pathological picture of the cerebro-spinal fluid on December 1st, 1920, was: Cells 50, globulin test positive, Wassermann reaction strongly positive, gold sol 5555554433.

By March, 1921, his general condition had improved so much that he returned to his work. During 1921 he has received two courses of special treatment. His speech is still slurred, but his mental condition is good. He finds no trouble with his work, and appears rational and intelligent. The last examination of his cerebro-spinal fluid was on November 29th, 1921, and the result was as follows: Cells 22, globulin and Wassermann tests both strongly positive, gold sol 5555555221. One can therefore say that a considerable part of the symptom-complex of general paralysis of the insane has for the time being at any rate disappeared, although the cerebro-spinal fluid picture is still absolutely pathognomonic of that condition.

The cases were all under the care of Mr. McDonagh, and my thanks are due to him for his kindness in allowing me to make use of them, and for his unfailing help and resourcefulness when difficulties were encountered. Without his co-operation the work could not have been done. Furthermore, I cannot conclude this survey without stating that I have merely carried on the work which was begun by the late Dr. Lawrence Shaw, and which was cut short by his untimely death in March, 1921. To him, therefore, belongs much of the credit for the good results obtained. The pathological work was done by Mr. Victor Corbett, and to him also I express my thanks.

REFERENCES.

¹ McDonagh: *Veneral Diseases* (1920), chapter xii. ² Barbat: *Journ. Amer. Med. Assoc.* (1918), i, 147. ³ Solomon: *Journ. Amer. Med. Assoc.* (1918), ii, 15.

THE TREATMENT AND PROGNOSIS OF LEPROSY.*

BY

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Of the general measures that can be taken for the benefit of lepers the following are essential:

(a) Regular meals of abundant food, including plenty of milk. Unfortunately I do not know what is the diet of the majority of patients at Makogai. I only know what the Government ration is, and that is certainly not the complete diet of the patients.

(b) A literally open-air life. At Makogai the wards, open-air as they are, are used merely as dormitories, the patients spending practically all their time in the shade of trees, or in shelters or in their gardens.

(c) Gentle exercise and daily baths. The latter are very important from the ease with which lepers get small wounds. If the skin is clean there is not much harm from them, but if the skin is dirty they may form the starting point of very serious infection.

(d) Happiness of mind, obtained by kindly personal interest, plenty of amusement, and remunerative work. There should be as little petty discipline and interference as possible, and there should be no talk nor hint, whether by staff, patients, or visitors, of the loathsomeness or incurability of the disease.

Leprosy is not incurable, nor is it nearly as loathsome as many other diseases. But though we disapprove, we must still recognize and allow for the stigma that is attached to leprosy, a stigma due in part to the rareness of the disease in civilized countries with a corresponding ignorance on the part of the general public. This stigma will, of course, soon pass away, just as the horror with which sleeping sickness was regarded twenty years ago has disappeared with the increase of knowledge. One can have nothing but praise for the humane campaign of the Hawaiian leprologists for the true education of the public and the consequent eradication of this mediaeval stigma. Leprosy is a disease of such low infectivity that it appears to me to be the ideal disease for treatment at the patient's home. I do not agree that complete compulsory segregation will ever succeed in wiping the disease out of Fiji, whereas segregation at home or in an

* A paper read at a meeting of the Fiji Branch of the British Medical Association, May, 1922.

asylum in the patient's own district (say, in an annexe to the provincial hospitals) might be much more successful.

There is a wide field for simple surgical measures, especially in the septic infections that are so troublesome. Perforating ulcers, often situated superficial to very chronic adventitious bursae, are best treated by excision with the bursae. Rhinitis, iritis, and neuritis are, after sepsis, perhaps the commonest symptoms calling for treatment. Often the intractable neuritis is enormously improved by cutting down on the nerve in the whole length of the enlarged portion and peeling the epineurium from the inflamed nerve. The wound is closed and the relief is immediate. The rhinitis, especially if very fetid, is much improved by irrigation twice daily and packing with sterilized gauze. Leprous iritis must be treated in the same way as iritis from other causes. Septic ulcers heal with remarkable rapidity if they are carefully tended, as is the case at Makogai, where our sisters and dressers perform an average of one hundred and fifty dressings daily.

Specific Treatment.

I have tried, amongst others, the following specific treatments:

(1) By the intravenous injection of tartar emetic. Although two cases were given 43 grains in thirty-five injections and 46 grains in thirty-seven injections respectively, there was no improvement which could be attributed to the tartar emetic. Therefore I regard this treatment as useless for leprosy.

(2) By the intramuscular injection of ethyl esters of chaulmoogra oil. This method is expensive and very painful, and is not as effective as methods 3 and 5 detailed below. I am now trying this drug intravenously. It is well borne, but I have not yet experience enough to give an opinion as to its value.

(3) By intravenous and oral administration of sodium hydriocarpate. This is also an expensive method. It is not as effective as method 5 detailed below, but if one misses the vein and gives the drug subcutaneously the resulting swelling is not so painful as in the case of the oil and is more rapidly absorbed.

(4) By the intramuscular injection of chaulmoogra oil in various mixtures, chiefly according to Heiser's formula. This is painful, and the injections cause a fibrous degeneration of the muscles. Further, there is no knowing how much is absorbed, for months after the injection the oil may be aspirated unchanged from the injection site. Nevertheless, this treatment is valuable and the patients do well on it.

(5) By the intravenous injection of crude chaulmoogra oil. A good average specimen of chaulmoogra oil at room temperature in Fiji consists of about equal parts of solid and liquid constituents. This is sterilized by heat. From 5 to 15 minims of the oil at body temperature are injected once, twice, or three times daily. My present plan is to give a fortnight's rest at the end of each four weeks' injections. The treatment is maintained until a "treatment reaction" occurs, when it is stopped until the reaction is over. I used to give the oil intravenously in a mixture with ether and iodine, or carbolic, but find the crude oil as above to be more satisfactory. During the last two years 35,000 intravenous injections of chaulmoogra oil have been given at Makogai. Syphilis, compensated heart diseases, tuberculosis, and the filarial diseases are not necessarily contraindications. Cases of albuminuria without casts have lost their albuminuria during treatment with this method. Chaulmoogra oil was first given intravenously by Varham, Stevenel, and Noc. They gave it in fine emulsion; but their doses were very small, being about one-hundredth to one-fortieth of the doses given by me. Nevertheless they obtained good results.

Chaulmoogra oil is so unpleasant to take by the mouth or subcutaneously that for years efforts have been made to find an unirritating active principle. One of the earliest of these was "antileprol," rediscovered recently and much praised as the ethyl esters or "Dean derivatives" by the Hawaiian leprologists. Another rediscovery is Sir Leonard Rogers's sodium hydriocarpate and gynocardate, the sodium salts of hydriocarpic and gynocardic acids, which were used twenty years ago by Roux.

These derivatives of chaulmoogra oil seem to act in the same way as the oil itself, over which they have no real advantage. Their action is not, I think, due to the purely antiseptic action of the oil, which is stated to be selective for the acid-fast group. Injections of chaulmoogra oil cause a transient leucocytosis which might repay investigation. Whatever the mode of action may be, there is no doubt that

chaulmoogra oil taken over long periods does ameliorate most cases of leprosy and cure some. After weeks or months of treatment a stationary case will have a "treatment reaction," evidenced by fever, eruption, and neuritis, hardly if at all to be distinguished during the fastigium from true leprotic fever. After the subsidence of the symptoms, however, a definite change for the better takes place. Treatment must be carried on for years.

Prognosis.

In early and mild cases there is a fair hope of cure or arrest of the disease. In pure nerve leprosy arrest of the disease has already taken place in a large number of the cases admitted to Makogai. I can see no justification for the segregation of these patients, many of whom are not capable of transmitting the infection at the time they are signed up. Yet if such a patient is admitted to the asylum the law requires that he remain segregated for a minimum of two years.

Advanced nodular cases or cases with marked nerve deformity are comparable to cases of generalized tuberculosis and cases of fibrous phthisis respectively, for in the one set of cases the body is little more than a culture medium for the bacilli, whilst in the other the disease, although it may have ceased to be active and infective, has caused immense loss of tissue and deformity. Such cases are, to use the layman's language, incurable.

In many cases leprosy actually prolongs life, for if a man contracts the disease he orders his life sanely with the idea of combating not merely his leprosy but also the possibility of other diseases and vices. I can give no figures for the length of life after infection, but from modern researches, especially those of Sir Leonard Rogers, it appears that in the vast majority of cases infection takes place during the first few years of life. Yet the majority of our cases die at an advanced age.

Lepers do not as a rule die of leprosy. The causes of death in the first 157 deaths at Makogai are as follows:

Tuberculosis 42, septic infection 31, nephritis 18, leprosy 14, exhaustion 5, undetermined 5, tetanus 4, senility 3, pneumonia 3, dysentery 3, suicide 3, amyloid disease 2, malignant disease 2, filariasis 2, peritonitis 2, influenza 2, mitral disease 1, angina pectoris 1, pulmonary embolus 1, cerebral tumour 1, duodenal ulcer 1, intestinal ulceration 1, bronchitis 1, renal abscess 1, general paralysis of the insane 1, epilepsy 1, hemiplegia 1, pharyngeal ulceration 1, diabetes 1, syphilis 1, anaesthesia 1, fatty heart 1.

From the above it is seen that tuberculosis and sepsis are the chief causes of death. The prognosis in civilized races is far and away better than in lower races. Osler, for instance, records the case of a clergyman performing his duties for thirty years whilst a leper, though none of his flock knew of his disease. Similar cases of lepers, unsuspected by the general public, living active beneficent lives, occur in most of the countries in which the disease is endemic, including Fiji.

A SIMPLE PORTABLE APPARATUS FOR CONTINUOUS OXYGEN ADMINISTRATION.

BY

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For many years oxygen has been largely used in the treatment of pneumonia, but generally it is given sporadically and rather with the idea of meeting some crisis in the patient's condition. Its use as a continuous therapeutic agent came under the writer's especial consideration in the treatment of severe cases of bronchopneumonia, complicating pertussis and measles, in the wards of the infectious block of the East London Hospital for Children. Dyspnoea and cyanosis were of course predominant symptoms in many cases, and the lack of proper oxygenation of the blood appeared to be a serious, often a fatal, handicap to recovery. Physiological, pathological, and chemical work upon the oxygenation of the blood also point in the direction hinted at by these clinical signs. Pneumonia is certainly a condition in which there is often anoxaemia; the place of oxygen in its treatment should therefore be one rather of regular use than of spasmodic effort. The same is true of other conditions complicated by lack of oxygen, such as chronic bronchitis and emphysema, asthma, and many types of heart