SOME OBSERVATIONS ON THE TREATMENT OF LEPROSY.

by

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Personal observations on the treatment of leprosy in the Leper Settlement, Mombasa, Kenya Colony, British East Africa, extend over a period of three years; from December 1928 to December 1931. Most of the patients come from the surrounding coast area, their homes being so far away that they would be unable to attend the Settlement regularly for treatment purposes. No compulsion is exercised in keeping the patients in the Settlement. It has been impressed upon them that they can leave when they please; that the Settlement is not a prison, but a home for the treatment of their condition, for their health and happiness. So much are the patients impressed by the freedom they enjoy that when the time comes for their discharge they are very unwilling to leave the Settlement. It is only with difficulty that they are made to understand that their discharge makes room in the Settlement for other patients to benefit by the treatment. Persons discharged soon spread the "habari" (the Swahili word for news) of the existence of the Settlement; of the freedom which is allowed, and of the treatment they receive. In fact discharged patients are the Settlement's most useful and

and/ active propaganda agents.

It has been found in East Africa as well as in other parts of the world that compulsory segregation defeats its own end in that early cases, as well as more advanced cases, hide themselves away for fear of being incarcerated. The object of treatment is to stamp out leprosy and this can only be done if cases are treated early. When patients realise that they will not be shut away for the rest of their lives and that they will be treated with sympathy and understanding, they will present themselves early for treatment.

The cases observed are shown in Table No.I It will be noticed that a number of patients left the Settlement before treatment was completed. These cases came from a neighbouring village, stayed in the Settlement for six months, and showed decided improvement under treatment.

TABLE I.

Number of Cases treated	Number discharged				Remaining.
	Cured	Arrested	Left Settlement before treatment complete	Deaths	
69	6	7	I3	3	40.

SITUATION AND CLIMATIC CONDITIONS OF MOMBASA.

Mombasa is the Port of Kenya Colony, British East Africa. It is situated in Latitude 4° 4′ South and Longitude 39° 42′ East, and is 60 feet above sea level. The following figures are illustrative of the average temperature, rainfall, and relative humidity taken over a period of ten years :-

Average maximum temperature	90° F.
Average mean temperature	82° F.
Average minimum temperature	76° F.
Average yearly rainfall	30 inches.
Average relative humidity	68 %

During the cool season (April to September) the South Monsoon blows; there are heavy showers and thunderstorms in April, May, and June - the long rains - when the average temperature is 78° F. and the average relative humidity is 78 %. During the long rains and for a short period thereafter the weather is delightfully cool. Between October and December there are gentle showers of rain - the short rains -following which the hot weather proper sets in. The hot months then are December, January, February and March. Gentle showers are experienced throughout the year. Mombasa has a tropical climate usual to coastal areas; damp, and

and/ fairly hot, but with no extremes of temperature.

SOME NATIVE BELIEFS AND CUSTOMS.

The natives of the surrounding coast area called by the Swahili "Washenzi" (meaning these illiterates) do not permit lepers to marry. They believe that women who marry lepers must inevitably get the disease; that children born of leper parents are not born with the disease, but that they develop leprosy ultimately no matter whether the children live with their parents or are removed from them at an early age. Lepers are not allowed to dwell in native towns or villages, but are requested by the residents to leave. If they fail to comply with this request they are brought before the Chief whose word is law, and who expels them. On no account must they have social intercourse with the residents. If the leper is foolish enough to ignore the Chief's ruling, he is hounded from the twon by the inhabitants. These unfortunates are cast out of their social circles and are not permitted to live within two miles of the native village or township. Outside this limit they are allowed to build huts for themselves. If they are fortunate enough to have any friends or relatives they are usually supplied with a meagre allowance of food. If they have neither friends not relations they must fend for themselves as best they can.

Some natives believe that leprosy results if they steal from a neighbours "Shamba" (garden or plantation), particularly if the owner has put a curse upon such thieves. Others believe that by passing certain haunted trees wherein the Devil dwells (Shaitani lala, meaning devil sleeps or stays) the devil takes possession of the passer and leprosy results.

These native beliefs and customs appear to be prevalent among the coastal natives other than the Mohamedans. In all probability there are many similar beliefs but the writer has been unable to collect further details.

MOHAMEDAN LAW AND THE KORAN IN RELATION TO LEPROSY.

Bukhar and Muslim who were Mohamet's scribes wrote 'Mohamet said "Keep away from a person suffering from Leprosy as you would keep away from a lion"' It appears from this that Mohamedans believe leprosy to be highly infectious and fear it very much. By the Law of Mohamet the High Priest can order all lepers to leave the town or village in which they are residing. This law also states that a leper so expelled must be supplied with food and clothing. If the lepers refuse to leave when ordered to they are removed by force. Mohamedan Law (Sheria) states that if a man gets leprosy his wife can divorce him, or vice versa. The Priest who grants the divorce must however be convinced that one or other of the party is suffering from leprosy. The healthy party of the divorce can remarry. The Koran says that if a child is born of leper parents he has the disease in his blood and must inevitably get leprosy. There is a law relating to the marriage of lepers which states that a leper can marry a healthy person provided that the latter knows that the former is a leper. If it is agreed before a Priest of Islam that a healthy person wishes to marry a leper and the marriage takes place, then

then/ on no account can a divorce be granted at a later date.

For the treatment of leprosy the Koran advises the oil of green grapes and the bile of a vulture in equal parts. This is applied daily to the body of the leper, the medicine being freshly prepared every third day. There appears to be no record as to the results of this treatment.

These customs and beliefs are interesting in that it appears to be difficult to see which are strictly native beliefs and which are influenced by the Mohamedan religion. It seems that the Native beliefs are strictly those of the non-Mohamedan natives, yet it would appear that they are influenced by the beliefs of the Mohamedans.

Some idea of the customs and beliefs is necessary to the Leprologist if he is to be successful in getting patients to attend regularly for treatment. At times difficulty is experienced owing to their beliefs and customs with regard to leprosy, and a knowledge of these often makes the problem of treatment easier. If the patients can be made to believe that a "Dudu" (germ) is responsible for their condition and that the object of the treatment

treatment/ is to kill the "Dudu" they are much more ready and willing to undergo lengthy treatment.

THE LEPER SETTLEMENT.

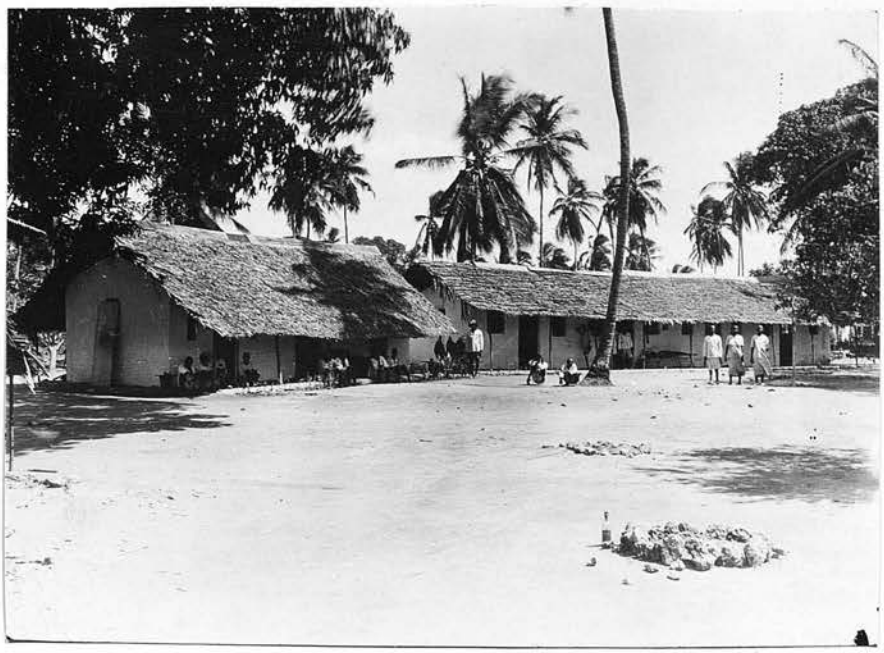
The Settlement is situated on the north shore of Mombasa island. It covers an area of over thirty acres, part of which is under cultivation. There are many cocoanut palms, orange and lemon trees in the grounds. The patients grow mohogo (local arrowroot), tomatoes, pineapples, paw-paw, and bananas.

There are five temporary houses in the Settlement. One of these is used as a treatment room and is fitted up as such. The other four are used as living quarters - two large buildings and two small. Each large ward is divided up into ten rooms; each small one into five. To one side of the buildings are the kitchens and behind the wards are the closets. The rooms are fitted with steel beds equipped with felt mattresses and blankets, whilst near each bed is a table. Enamel plates and cups together with metal cooking pots are supplied. Uniforms are issued to all patients.

In 1922 a few lepers presented themselves for treatment at the Infectious Diseases Hospital, Mombasa, and were admitted. It would appear that there was no special reason for admitting them

them/ other than at the time it seemed the most suitable place; no other provision having been made for leper patients. In the same year the Settlement was founded to provide for patients in Mombasa and the surrounding coast area. A new Settlement built especially for lepers is now in existence at Mswambeni thirty miles south of Mombasa. In the near future all patients from the Mombasa Leper Establishment are to be transferred to this new Settlement.

No. I.



Part of the Settlement.

GENERAL REMARKS.

Leprosy belongs to that class of diseases which are dependent for recovery on the raising of the general resistance of the patient, and the use of certain remedies which though effective cannot be regarded as specific. In many cases leprosy is a self healing disease. When the general resistance is temporarily lowered by any cause (worms, syphilis, influenza) and if the lepra infection be present, early signs of the disease make their appearance. These early signs disappear as soon as the temporary cause of the lowered resistance is removed i.e. the resistance of the patient is again raised. It is therefore absolutely necessary in the treatment of leprosy to maintain the resistance of the patient at a high level. To do this one must look for and treat all conditions which may be the cause of the lowered resistance. Lowered resistance may as easily be caused by a faulty diet as by the presence of malaria, worm infestations or syphilis. It is as necessary to discover faults in the diet - over or under-feeding as the presence of malaria or other concurrent condition.

DIET.

An inquiry into the diet of this series of cases revealed that food was taken irregularly and consisted chiefly of boiled mohogo (local arrowroot) or posho (boiled indian corn). Fresh fruit and vegetables formed no part of their diet prior to their arrival in the Settlement. The following diet was arranged :-

Rice	I4 oz. daily
Lentils	3 oz. daily
Clarified butter (Ghee)	½ oz. daily
Unrefined sugar (Jagree)	I oz. daily
Salt	½ oz. daily
Beef	I2 oz. weekly

The various fruit and vegetables grown in the Settlement by the patients form an additional and very important part of their diet. The patients also keep fowls and goats and are so able to provide themselves with eggs and milk.

When all these articles are taken into account it can be realised that that patients are having a well balanced diet of high caloric value and a rich vitamin content.

The experience here is that during the first fortnight of their stay in the Settlement the patients show a dramatic improvement in their general health, and during the first month a decided improvement in the disease from which they are suffering. This is attributed to the pleasant surroundings in which they are placed; the nourishing food they get, and the fact that they are removed from the derision and taunts of their fellow men.

Many of these patients are so ashamed of their condition that they hide themselves away from others of the human race. Part of this is no doubt due to the native custom of hounding lepers from towns and villages. Often it is found that the lepers have been living in absolute hovels where neither fresh air nor sunshine can enter. Living in these conditions and having neither the vitality to fend for themselves nor the money to buy food they are in a very debilitated condition. It is no small wonder that their condition goes from bad to worse. When they are placed in the best possible surroundings without either care or worry their general improvement is in most cases very gratifying.

FRESH AIR AND SUNSHINE.

Fresh air, sunshine and exercise play an important part in treatment. The best way to keep the patients in the open is to give them some outdoor interest and this is done by giving each patient a plot of ground where he can grow his vegetables or keep his chickens. Some of the patients are engaged in making roofing, others in whitewashing the buildings. For this they are paid according to the work they perform and the few shillings they earn is an added stimulus to their work. These various occupations keep the patients in the open and give them the very necessary exercise to build up their flabby muscles. In some parts of the world walking and physical jerks are recommended but the experience with the African native is that some form of exercise which shows results is more effective. He can see the results of his labours in whitewashing or in gardening and will therefore do these with pleasure. Whereas he does not seem capable of grasping that walking and graduated exercises are doing him good, and these he would gladly shirk.

No.2.

Some patients engaged in fashioning roofing.

MALARIA IN LEPER PATIENTS.

On admission all patients are examined for malaria, a detailed examination being made of the spleen and any increase in size noted. Blood slides are taken and examined; a note being made as to the type of parasite found. A perusal of table No. 2 shows that all those infected with malaria had a subtertian infection. During the past three years (December I928 to December I93I) there has not been a single case of either benign tertian or quartan infection among these patients.

Cases showing subtertian parasites in the blood are given quinine starting with five grains in the day, and rapidly increasing the daily dose until thirty grains are taken in the day. The reason for starting with the smaller dose is that many of the patients have had repeated attacks of malaria and are in a very debilitated condition. If larger doses are given from the commencement there is always the danger of precipitating an attack of blackwater fever. There is one case on record here of a patient getting an attack of blackwater fever after having taken two grains of quinine and iron citrate.

TABLE 2.

Blood slides examined	Type of infection			Negative
	Tertian	Quartan	Subtertian	
69	0	0	28	4I
Four patients suffered from blackwater fever - three showing parasites in their blood. In one no parasites were found.				

Table showing malaria parasites found in the blood of lepers.

The following table shows how the dosage is increased and the length of time the quinine is continued :-

Ist. day	5 grains.	6th. day	30 grains.
2nd. day	I0 grains.	For fortnight	30 grains daily.
3rd. day	I5 grains.	For fortnight	20 grains daily.
4th. day	20 grains.	For month	I0 grains daily.
5th. day	25 grains.	Final month	5 grains daily.

In cases where there has not been a heavy infection the daily dosage of thirty grains is continued for a week, followed by twenty grains for a fortnight, and completing the course with five grains daily for a month. Throughout the course of quinine the bowels are kept well regulated.

Most patients are very anaemic after the attack of malaria; more especially is the anaemia marked in patients who have had repeated attacks. Iron and arsenic in one form or another is useful for combating this. The following prescription has been found most useful in this series of cases :-

R

Ferri. et ammon. cit.		grs iiss.
Liq. arsenical.		m. v.
Aq.	Ad.	Oz i.

Sig. Twice daily after meals.

For chronic enlargement of the spleen an ointment containing 2 % of the red iodide of mercury is rubbed ober the splenic area once a day acting as a counter irritant. In some cases the decrease in size of the spleen under this treatment is remarkable and in others the treatment fails completely, probably owing to the increase in size of the spleen being of very long duration.

If an attack of blackwater fever is precipitated a blood slide is taken and examined immediately. If malaria parasites are found then small doses of quinine are administered, starting with one grain of the bihydrochloride three times in the day. In cases where vomiting is marked quinine is given intramuscularly in three grain doses once in the day, the injections being discontinued when vomiting ceases and quinine is again given by the mouth. No increase in dosage of the quinine is made until the urine is quite clear, when the dose is increased by one grain daily until twenty grains are taken in the day. In every case patients are encouraged to drink large quantities of bland fluids. When vomiting is present fluids are given per rectum. If diarrhoea is also troublesome salines are given intravenously.

Suppression of urine is treated by hot applications to the loins. In cases where this is not successful in bringing on a flow of urine two grains of caffein citrate twice in the twenty four hours usually acts like a charm. The diet consists of nothing but milk until the urine is clear.

No antileprosy treatment is carried out during an attack of either malaria or blackwater fever. Early in the convalescence in malaria and later in blackwater fever antileprosy treatment is commenced. During the convalescence of both these conditions great care is taken that no severe lepra-reactions result from treatment.

WORM INFESTATIONS IN LEPER PATIENTS.

Worm infestation is an important cause of lowered resistance in lepers and a routine examination of the stools should be undertaken in all cases. Table No. 3 shows that in these cases the ankylostome is the chief offender. Next in order of frequency is the trichuris, followed by bilharzia, ascaris, and least frequent the tape worm. No known ill effects are caused by the trichuris and it is as well that this is so for there appears to be no known drug which causes its expulsion from the intestinal tract.

For the treatment of the hook-worm thymol is the best anthelmintic, and when this drug is available the following procedure is adopted :- a saline aperient is given the day before the treatment and on this day the patient gets only a fluid diet without fat. The morning following the aperient thymol is given in ten grain doses at hourly intervals till thirty grains have been given. Four hours after the last dose a further saline aperient is given. A week later the stools are again examined and if any ova are found the treatment is repeated.

TABLE 3.

Results of examination of stools in leper patients.

Type of ova or adult worm.	Number of cases.
Tape worm, ankylostome, ascaris trichuris, bilharzia.	2
Tape worm, ankylostome, ascaris, trichuris.	I
Tape worm, ankylostome, trichuris, bilharzia.	I
Ankylostome, trichuris, bilharzia.	I
Ankylostome, ascaris.	2
Ankylostome, trichuris.	4
Ascaris, trichuris.	20
Ankylostome.	24
Trichuris.	I
Bilharzia.	I
Stools examined - 69. Number negative - I2.	

In most cases here chenopodium and carbon tetrachloride are used because they are much cheaper and also fairly effective. The same preliminary treatment with saline aperients is carried out. The following prescription is used for adults :-

R

Ol. Chenopodium	m x
Carbon tetrachloride	m xxx
Paraff. Med.	Oz i

Two such doses are given at intervals of two hours and usually it is found necessary to repeat this treatment after a week.

Thymol is certainly more effective than carbon tetrachloride and chenopodium; it is also much more expensive than the two latter. No toxic effects have been observed with any of these drugs, though it must be noted that all cases have been treated under careful observation.

In the case of round worm infestation santonin in five grain doses for adults has been used with excellent results; smaller doses being used for children.

Most reliable in the treatment of tape worm infestations is the extract of male fern -

drachm doses in emulsion; the usual aperient treatment is carried out the day before. If the head of the worm is not expelled after the final aperient thirty minims of turpentine in emulsion is administered and usually brings away the head successfully.

For bilharzia infestation half a grain of sodium potassium antimony tartrate in ten cubic centimetres of distilled water is injected intravenously. The injections are given twice in the week gradually increasing the amount by half a grain at a time till two and a half grains are given at one injection. The total quantity injected is between twenty and twenty four grains. This treatment is most effective.

SYPHILIS IN LEPER PATIENTS.

The syphilis rate among the tribes from which these cases are drawm is known to be high and undoubtedly some of the patients suffer from syphilis and leprosy concurrently. On account of this fact very careful observations were made not only to determine the effect of syphilis of these patients, but also to endeavour to definitely acertain the serological effect of leprotic infection per se. Early in the investigations it was discovered that a serum precipitation test (the Kahn reaction being employed) was positive in a number of cases. This was not due to incidental attacks of lepra fever not was it possible to demonstrate in these particular cases any clinical evidence of syphilis. As this effect in the blood serum if caused by leprosy alone is of obvious importance, the matter was further persued and the results obtained will be referred to later.

The treatment of syphilis in the leper is similar to that of syphilis in general. Treatment is carried out by intravenous injections of "9I4" alternating with intramuscular injections of metallic bismuth. The treatment of syphilis is carried out concurrently with that of leprosy. The

The/ arsenicals sometimes usher in lepra reactions and a careful watch must be kept that these reactions are not excessive. On no account is the dose of "9I4" increased even if it is causing the slightest reaction. In some cases after the injection of "9I4" there is a very intense reaction, so severe at times may be this reaction that the patients life in endangered. In these cases all treatment by "9I4" is stopped and anti-syphilitic is continued by intramuscular injections of metallic bismuth alone. The following system of treatment was adopted in this series of cases :-

Ist	week	Intravenous "9I4" 0.3 gram.
mid-	week	Alepol intramuscularly.
2nd	week	Intramuscular metallic bismuth I c.c.
mid-	week	Alepol intramuscularly.
3rd	week	Intravenous "9I4" 0.3 gram.
mid-	week	Alepol intramuscularly.
4th	week	Intramuscular metallic bismuth I cc
mid-	week	Alepol intramuscularly. etc.,.

The courses cover four months after which there is a months rest from injections during which period small doses of potassium iodide are given orally.

In cases where it is decided to discontinue "9I4" preparations and where metallic

metallic/ bismuth is relied on alone, twelve injections are given at weekly intervals, followed by a months rest. The course is then repeated.

Anti-syphilitic treatment is carried out for a year and if found necessary is repeated for a further similar period.

Writing of the diagnosis of syphilis in lepers Muir (I) says that a negative Wassermann test excludes syphilis; but a positive Wassermann does not exclude leprosy. Furthermore it is considered that the Kahn precipitation test is more reliable than the Wassermann in the detection of syphilis in the leper as it is less likely to show false positives. Cochrane (2) says that as the position with regard to a positive Kahn always signifying a treponemal infection has not been unequivocally proved, the question then arises :- Should all lepers with positive Kahns be treated ? He lays down the following rules :- If the Kahn test is 3 plus or more give anti-syphilitic treatment. If 2 plus or less and the patient is improving, no treatment is given: If not improving give anti-syphilitic treatment. Muir (3) recommends a course of anti-syphilitic

anti-syphilitic/ treatment if the Wassermann or other reliable serum reaction is positive. If after treatment the serum is negative, he advises that the serum be reexamined every three months for two years.

THE KAHN TEST IN LEPROSY.

In these investigations it has been found that the Kahn test on its own is no criterion for the diagnosis of syphilis in the leper. It will be seen from table No. 4 that most of the lepers give a positive Kahn reaction though only a few show any clinical evidence of syphilis.

In January 1929 eight lepers giving a positive Kahn reaction, but showing no clinical evidence of syphilis were treated with anti-syphilitic remedies to determine whether anti-syphilitic treatment in the non-syphilitic leper had any effect on the Kahn reaction. These cases were given intravenous injections of "914" and intramuscular injections of metallic bismuth over a period of two years. Each course of injections lasted for three months and was followed by a months rest. Once in every six months the blood

blood/ was taken and subjected to the Kahn test. The result of this experiment was that the Kahn reaction was just as positive after the anti-syphilitic treatment as before. The conclusion arrived at is that anti-syphilitic treatment in the non-syphilitic leper does not result in the Kahn reaction becoming negative, nor does it become less positive. A further conclusion is that in many cases leprotic infection per se is followed by a constant positive Kahn reaction, even when syphilitic infection has been clinically exclused. Table No. 5 shows the types of leper patient who showing no clinical evidence of syphilis, but giving a positive Kahn reaction, were subjected to this test.

From these notes it can be appreciated that it is very difficult to assess the results of anti-syphilitic treatment in the syphilitic leper, as in this series of cases the Kahn reaction was not altered by anti-syphilitic treatment even in the syphilitic leper. Personal conclusions are that the Kahn test is not to be relied on as a test of cure.

Wardman (4) of the Purulia leprosy Hospital, Bihar, India, reports the treatment of

of/ twelve cases of syphilis in leper patients with intramuscular injections of bismuth salicylate - half a grain in five cubic centimetres of hydnocarpus oil. The Kahn reaction was taken before and after the course of injections. In every case, though in one case only four injections were given, the Kahn test was either negative or less positive after the injections. In four of these cases though the Kahn test was strongly positive before treatment, it was ± after. In Wardman's cases it would appear that the Kahn test was absolutely reliable both as regards diagnosis and assessing the results of treatment.

In the personal series of cases of syphilis in lepers treatment was continued for a year. and after this if there was no improvement in the leprotic condition under treatment, and no other cause found for the lowered resistance, the anti-syphilitic remedies were continued in further courses for another year.

The presence of untreated syphilis in the leper retards the improvement of the leprotic infection to a considerable extent. Furthermore leper patients suffering from syphilis seem to

to/ get more severe lepra reactions than do non-syphilitic lepers. It can be stated definitely that the treatment of concurrent syphilis does bring about improvement in the lepra condition and results in anti-leprotic treatment being more effective.

Table 4.

Results of Kahn reaction in 69 lepers.

Type	No	Kahn Test.					No. showing clinical evidence of syphilis.
		Plus 4	Plus 3	Plus 2	Plus I	Neg. 0.	
AI	6				I	5	0
A2 &	7	I		2	4		I(plus 4)
BI	6			2	4		0
B2	I0	3	6		I		I(plus 4) 2(plus 3)
B3	8	2	4	2			0
BIAI	6			4		2	I(plus 2)
BIA2	I6			4	I0	2	I(plus I)
B2A2	6		4	I	I		0
B3AI	4		I	3			0

Table 5.

Eight cases of leprosy. showing no clinical evidence of syphilis, but giving a positive Kahn Test, who were subjected to anti-syphilitic treatment over a period of two years - the Kahn reaction being taken every six months. There was no change in the Kahn reaction after treatment.

Type	Number	Kahn reaction.			
		Plus 4	Plus 3	Plus 2	Plus I
A2	I			I	
BI	I			I	
B2	3	I	I		I
B3	I	I			
B2A2	I		I		
B3AI	I			I	

NOTES ON CONDITIONS CONCURRENT WITH LEPROSY.

At the Leonard Wood Memorial Conference on Leprosy (5) held in Manilla in the Philippines in January 1931, Leprologists from all parts of the world met to discuss all problems connected with leprosy. It was agreed by physicians with considerable experience in the disease that every effort should be made to eliminate intercurrent affections which lower the general resistance, and that such is essential to successful treatment. Diet, exercise, and social welfare were also considered of importance. Muir (6) emphasises the importance of elimination of intercurrent conditions. The soundness of these views is unquestionable. There can be no doubt that malaria, worm infestations, syphilis, etc., lower the general resistance of the patient and should receive early and energetic treatment. Often no improvement is seen in leprosy until these concurrent affections are satisfactorily dealt with. When the undermining influence of these conditions is removed the general resistance of the patient is raised and he is in a much more satisfactory condition to combat the leprotic infection.

Other conditions such as broncho-pneumonia, bronchitis, gonorrhoea, conjunctivitis, iritis, pyorrhoea, skin diseases, etc., are treated on the general lines laid down for these diseases. It might be mentioned that iritis in lepers is often a very chronic condition and in the majority of cases is probably due to leprosy. In all cases I% Atropin sulphate drops are instilled into the eye three times daily, the anti-leprosy remedies are continued and there is no doubt that they appear to be of considerable benefit in the resolution of the iritis. There was very little eye involvement in this series of cases and so there was no opportunity for testing the so called specific remedies recommended for the treatment of leprotic eye disease, which will be referred to later.

One patient in this series of cases suffered from periods of extreme depression alternating with periods of exhaltation. While depressed he would not talk, and would sit on his bed and stare into space. He was firmly convinced that the other patients disliked him and had decided to make life unbearable for him. He had a good appetite and did not suffer from insomnia, though he was constipated. During

During/ periods of excitation he would carry on long and heated arguments with the patients and if the was opposed in any way he would become violent. This patient had rather severe lepra reactions and it was during these that he was most depressed. He was isolated and attended day and night to guard against possible suicide. All leprosy treatment was stopped and he was given a light nourishing diet. After two months the patient was quite recovered and has now been well for two years. This case is interesting in that it somewhat resembled manic depressive insanity, though it was not typical of that condition, and in that recovery was speedy when anti-leprosy treatment was stopped. It has been noticed that some of the patients get depressed and somewhat melancholy under treatment, though the case referred to was the only one with any resemblance to manic depressive insanity. There can be no doubt that this case was due essentially to severe lepra-reactions, which should be guarded against.

THE CLASSIFICATION OF LEPROSY.

Dr. Muir of Calcutta has evolved a very comprehensive classification of leprosy in which he divides cases into types and stages. For purposes of treatment this classification will be used in this paper. There are three main types:- I.Nerve leprosy.2.Skin leprosy.3.Mixed leprosy. These again are subdivided into stages; the early and late nerve cases: the early, medium, and late skin cases; the presence of the nerve and skin element in the same patient gives the mixed cases. It must be realised, however, that one stage may merge into the next and in fact that there is no sharp line of demarcation between these stages . Each type of leprosy is represented by a letter of the alphabet - "A" signifying nerve cases and "B" skin cases. The combination "AB" denotes mixed leprosy. Numerals represent the stage of the leprotic infection.

AI represents early nerve leprosy where hypopigmented patches are seen together with anaesthesia and nerve enlargement; later there is muscular paralysis. A2 refers to secondary anaesthetic leprosy. It is in this stage that

that/ deformities of the extremities are seen, due to extensive nerve involvement and destruction. There is loss of pressure and gross heat sensation. Trophic ulcers make their appearance. BI is the sign used for early skin cases where there are slight, perhaps evanescent rashes of an erythematous nature. B2 designates skin cases with typical plaques which may be few or many; they may be small or large. The nasal scraping is positive for the mycobacterium leprae. B3 indicates nodular leprosy. Nodules may be few or many; they may be confined to the face or may be scatterred over the body as well. Myriads of the mycobacterium leprae are found in the nasal scraping.

At the Leonard Wood Memorial Conference (7) it was agreed that cases of leprosy should be divided into two major types and that these be designated "neural" and "cutaneous". Clinically there are many cases which may be considered essentially "neural", though some of these cases subsequently become "cutaneous". The Conference agreed that skin leprosy does not exist as a type but that in a few cases it may be present before lesions develop elsewhere, and that there is

is/ reason to believe that ultimately the organisms become disseminated and involve the nerves. "In order to minimize confusion it is deemed desirable to class all cases with leprotic lesions of the skin as "cutaneous" " In cutaneous leprosy there may be varying degrees of nerve involvement which should be recorded to indicate the degree of this involvement.

Table No. 6 shows the number of patients treated of each type and stage; the majority of which are of mixed leprosy. Quite a large number of cases have been typed as "Skin" or "Cutaneous" and these were essentially skin cases showing no definite nerve involvement.

Table 6.

Total number of cases 69.								
Nerve Cases I3		Skin cases 24			Mixed cases 32			
AI	A2	BI	B2	B3	BIAI	BIA2	B2A2	B3AI
6	7	6	I0	8	6	I6	6	4

TREATMENT OF LEPROSY WITH HYDNOCARPUS OIL PREPARATIONS.

In India chaulmoogra oil was an old and popular remedy in the treatment of leprosy. It was administered orally with very little effect, probably owing to its extremely nauseating properties when taken in large doses.

In I854 Chaulmoogra oil was brought to the notice of the Western Medical World (8). This oil is obtained from the decorticated seeds of the various species belonging to the botanical family Flacourtiaceae. In India the commonest species is the Hydnocarpus Wightiana; in Burma Taraktogenos Kurzii; and in Siam and Indo-China Hydnocarpus Anthelmintica. According to Muir (9) the oil should be obtained by cold compression from ripe, fresh, seeds. The oil derived from unripe or stale seeds being unfit for injection as it is very irritating. The oil should be filtered till it is quite clear, and stored so as not to come in contact with either air or moisture. It should be sterilised by heating to I20° C. for half an hour so that it becomes suitable for immediate use and the formation of irritating substances is prevented.

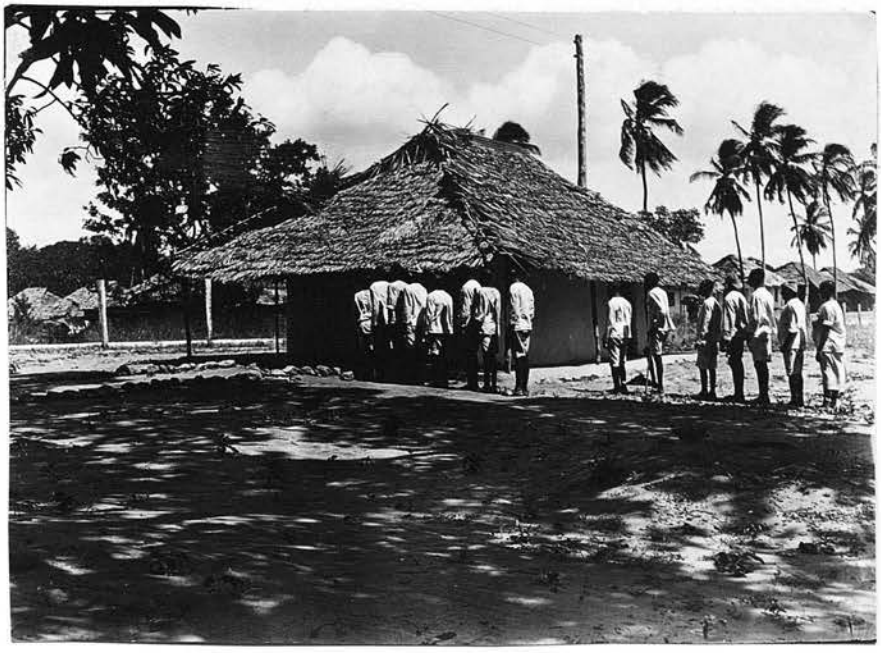
The first cases of leprosy to be treated by intramuscular injections of chaulmoogra oil showed no improvement and the injections caused considerable pain. (I0) Lara and wade (II) using the Mercado mixture which consisted of 60 c.c. chaulmoogra oil and 60 c.c. of camphorated oil and 4 grams of resorcin to lessen pain, reported great improvement in twenty four cases out of fifty two cases treated. Heiser (I2) reported improvement by this method, though it could not be regarded as a specific. Muir (I3) discovered that the pure oil obtained from the ripe seeds of the Hydnocarpus Wightiana could be used direct, with the addition of 4 % creosote as an antiseptic, for intramuscular injections with practically no pain and with results as good as those obtained with the ethyl esters. Wilson (I4) of Korea used sterile oil from Hydnocarpus Anthelmintica with I% camphor, and found this to be practically painless and the results of treatment better than the ethyl esters. In I9I6 Rogers (I5) showed that a 3% solution of sodium gynocardate and hydnocarpate could be injected intravenously; he showed that by this treatment both general and local reactions were produced which resulted in the swelling up and softening of the thickened tissues and that this was accompanied by great destruction of the

the/ leprosy bacillus. By this treatment 41% of his cases showed complete disappearance of the lesions (16). Injection of Sodium Gynocardate and Sodium Hydnocarpate is very painful when injected subcutaneously or intramuscularly and very irritating when given intravenously. Furthermore it causes blocking of the veins.

Hollmann and Dean (17) recorded their results in treating cases by intramuscular injection of the ethyl esters of the fatty acids of chaulmoogra oil. Seventeen of their twenty six cases showed marked improvement, three improved, one slightly improved, though treatment was only continued for three months or less. At Honolulu M'Donald (18) used the ethyl esters intramuscularly in gradually increasing doses from I c.c. to 6 c.c. After the injection leprotic fever and new eruptions made their appearance which, however, were followed by improvement. The ethyl esters are used extensively at Culion in the Philippine Islands and other parts of the world with excellent results. Muir (19) has described a simple, cheap and effecient method of making the ethyl esters. In 1927 Rogers(20,21) overcame the vein difficulty by introducing a sodium salt of a selected fraction of the lower melting point fatty acids of hydnocarpus oil.

He showed that a 3% solution could be injected either subcutaneously or intramuscularly without pain and with rapid absorption, and that a I% solution could be injected intravenously with perfect safety. Rogers is convinced that this is a more effective remedy against leprosy then either the ethyl esters or the pure oil obtained from the Hydnocarpus Wightiana, for he found cases failing to respond to the two latter and improving under this preparation. Muir(22) found that a 2% solution of the sodium salt can be given intravenously by drawing up an equal quantity of blood from the vein into the syringe containing the solution and mixing before injection. The sodium salt of a selected fraction of the lower melting point fatty acids of hydnocarpus, is now sold by Burroughs, Welcome under the name of Alepol.

No. 3.



Leper patients waiting for injections.

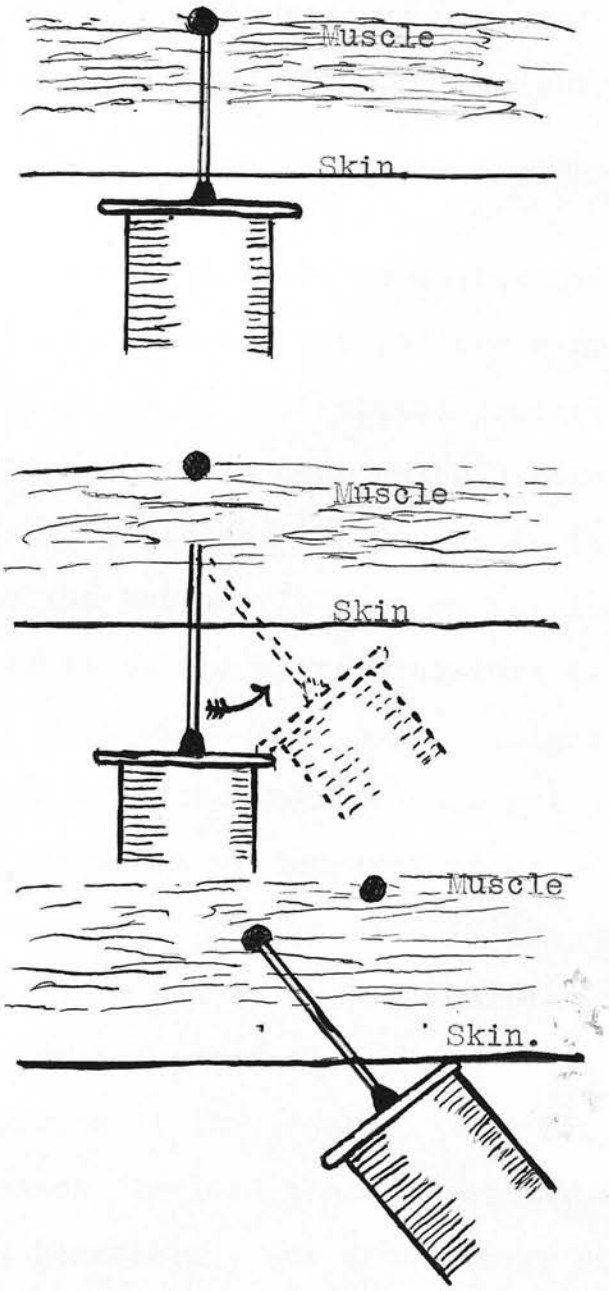
ALEPOL TREATMENT.

In this series of cases Alepol has been used for treatment. The principle reasons for its use are as follows :- In the first place it is less bulky to import and this is no small consideration in places like East Africa where chaulmoogra oil is not obtainable locally, and where it is found necessary to import a drug for the treatment of leprosy. Secondly, it has been recorded to be as effective as chaulmoogra oil and according to Sir Leonard Rogers it is more effective.

A 3% solution of Alepol is made up in a water solution of ½% carbolic which is used as a preservative; this is poured into a bottle to which is fitted a rubber cap and the solution is then autoclaved for half an hour to sterilise it. When an autoclave is not available the bottle containing the solution is placed in a water bath which is kept boiling continuously for two hours. The latter method is efficient and can be relied on to sterilise the solution in the absence of an autoclave.

Treatment begins with small doses which are gradually increased. The site for injection is the upper and outer quadrant of the gluteal region which is first carefully sterilised with either a 2% solution of picric acid in spirit or tincture of iodine. The syringe and needles are sterilised by boiling. The injection is made deep into the gluteal muscle, care being taken that the needle is not pushed in too far so as to impinge on the iliac bone. After the injection the part is well massaged to ensure even distribution in the muscle and fairly rapid absorption. This procedure is adopted for doses up to 2 c.c. When larger doses are to be injected the aim is to make one puncture with the needle inject 2 c.c. of the solution., withdraw the needle somewhat, then introduce it further in another direction so that the next 2 c.c. of the solution will enter a different part of the muscle. By this means through one skin puncture the solution can be distributed over several areas of muscle. If large quantities are injected into one area of muscle this must of necessity cause quite extensive separation and damage to the muscle fibres so that ultimately there will be a large area of fibrosis. Small quantities of the solution do not cause such extensive separation and the resulting fibrosis is hardly appreciable.

Method of injecting large quantities of Alepol.



After a course of Alepol there is a months rest during which period no injections are given. Periods of injections and rest alternate so that in the year four complete courses of Alepol are given.

In cases where reactions are extremely severe injections are stopped for a month or longer to allow of the natural process of repair, after which half the dose which ushered in the reaction is given and the dosage is increased as shown in the tables. In case of any further severe reaction the above procedure is again adopted. Most cases show only a slight response to the drug, in the form of bone and joint pains or some elevation of temperature or both; or some reddening of an isolated skin lesion, a painful neuritis, or a sudden marked increase in the severity of the existing lesions which may lead to ulceration if the reaction has been more severe. In all cases provided these reactions are slight, they are beneficial, for after their subsidence the lesions generally improve. When reactions are severe they require special treatment. If there is a sharp rise of temperature the patient is confined to bed and a saline aperient is administer-

ed administered/. Formerly in this Settlement the ordinary analgesics were used for the treatment of severe joint pains and neuritis, but seldom gave relief. Muir (23) recommends the use of tincture of ephedrine in thirty minim doses by the mouth. Cochrane (24) advises ephedrine hydrochloride half a grain by the mouth. The writer used half a grain of ephedrine in a drachm of water orally and found that the bone and joint pains were greatly relieved in ten minutes. If the pains were not markedly relieved in fifteen minutes the dose was repeated. Ephedrine is found to act like a charm in relieving the neuritic and the bone and joint pains of lepra reactions.

In cases where the febrile reaction is severe and does not abate in forty eight hours, specific treatment is carried out to bring the temperature down. Muir has shown that the salts of the heavy metals are of value in checking excessive febrile reactions. In such cases the writer gave an intravenous injection of half a grain of sodium antimony tartrate in ten cubic centimetres of distilled and sterile water. These injections were given every second day if found necessary. As a rule one injection was sufficient

sufficient/ to bring the temperature to normal within forty eight hours. When the reactions were very severe two or more injections were given. In two cases it was found necessary to give four injections at intervals of two days before the temperature reached the normal line. Apart from its specific action in controling the temperature, the injection seemed to benefit the general condition of the patient.

It is necessary to go into some detail as to how the various types and stages of leprosy responded to Alepol injections.

Table 7.

Showing course of Alepol together with dosage.

Ist week	0.5 c.c.	6th week	5.5 c.c.
mid-week	I.0 c.c.	mid-week	6.0 c.c.
2nd week	I.5 c.c.	7th week	6.5 c.c.
mid-week	2.0 c.c.	mid-week	7.0 c.c.
3rd week	2.5 c.c.	8th week	7.5 c.c.
mid-week	3.0 c.c.	mid-week	8.0 c.c.
4th week	3.5 c.c.	9th week	8.0 c.c.
mid-week	4.0 c.c.	mid-week	8.0 c.c.
5th week	4.5 c.c.	I0th week	8.0 c.c.
mid-week	5.0 c.c.	mid-week	8.0 c.c.

NERVE CASES.

In AI cases the reaction to Alepol is usually apparent from the tenderness along the affected nerves; this tenderness is usually most marked in that part of the ulnar nerve as it passes around the medial condyle of the humerus. It is a well established early diagnostic sign that the nerve affected with leprotic infiltration is thickened in a fusiform manner, and that the thickening is most easily felt where the nerve is nearest the bone. The thickened part of the nerve is usually slightly swollen during a reaction after Alepol. The tenderness usually subsides and the thickening diminishes to a certain extent two days after the injection. In some cases the tenderness persists for a longer period and provided it is not too severe the increase in dosage of Alepol is continued. If pain and swelling are extremely severe then a weeks rest is given and treatment is recommenced with half the dose which was responsible for the severity of the reaction. In these cases there has been no change in the appearance of the hypopigmented patches either during or after treatment.

During the first course of Alepol, rashes make their appearance as a rule two or three days after the injection. They are generally very difficult to see in the black skin of the African, but can be made out if the patient is placed between the source of light and the observer. The rashes are evanescent, of an erythematous nature, cause no trouble and generally disappear from within a few hours to a couple of days of making their appearance.

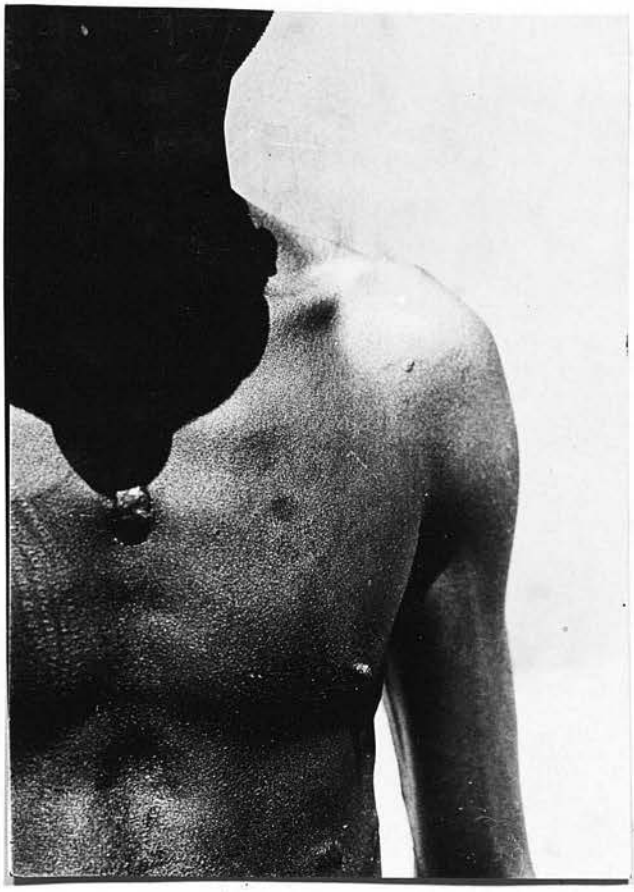
In four out of the six cases of early nerve leprosy there were slight febrile reactions during the first course of Alepol. These were in no way severe and the temperature came to normal in a little over twenty four hours. In the other two cases there were no febrile reactions though there was some tenderness along affected nerves. During the further courses of Alepol there was no reaction in any case though there was slight tenderness along affected nerves. After six months treatment in the four cases which had febrile reactions during the first course of Alepol, and after four months in the two which had no febrile reactions, there was no further

further/ pain along the affected nerves and no further appearance of evanescent rashes. The formerly thickened nerves could hardly be felt.

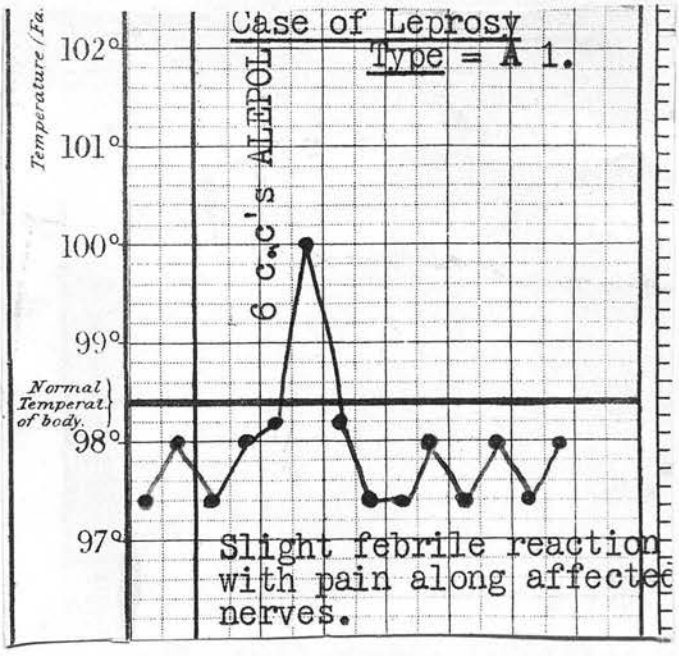
Two further courses of Alepol were given during which there were no reactions of any kind; no nerve tenderness, and the affected nerves could not be felt. These six patients sere discharged as cured, but were instructed to report every three months. They have reported once in every three months for a year and there has not been the slightest sign of any recurrence. The intention is to keep these patients under observation for two years from the day of their discharge.

With regard to A2 cases where as the late Dr. Hansen said (25) " Usually there is a miserable rudiment of a human being, with more or less paralysed hands and feet, with unclosable eyes, of which part of the cornea is opaque, and from which tears run down the cheeks, and with paralysed facial muscles unable to close the mouth, so that saliva dribbles from it. Such cases may, however, live long, and reach great ages, if under such circumstanees this can be looked on as an advantage." For such cases there is no hope of cure, and from this graphic description it can be well

No.4



AI case. Note hypopigmented patches about left shoulder and in epigastric region. Treated with Alepol.



well/ appreciated that no treatment can clear up these conditions. But experience has shown that the progress of the disease can be arrested in these late nerve cases provided that treatment is not delayed too long, and the cases are not too far advanced.

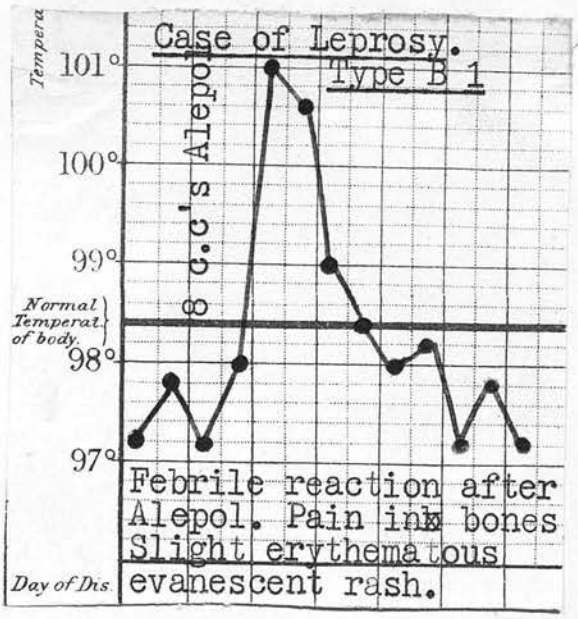
Treatment with Alepol in these cases is carried out as in AI lepers. In not one of these seven cases has there been any visible reaction, either febrile or otherwise, after injections. During the course of injections the patients steadilty gained in weight and were certainly physically more fit. In gauging the benefit of treatment it must be remembered that there is a tendency in these late nerve cases to advance up to a certain point and then for the disease to progress no further. All the seven cases treated showed no advance of the disease over a period of two years. In these cases the disease had probably advanced up to a certain point and then become arrested, and the opinion is, that it would be a gross misstatement of facts if this arrest was acredited alone to the treatment, and no account taken of the natural arrest or burning out of these cases. Treatment certainly has a

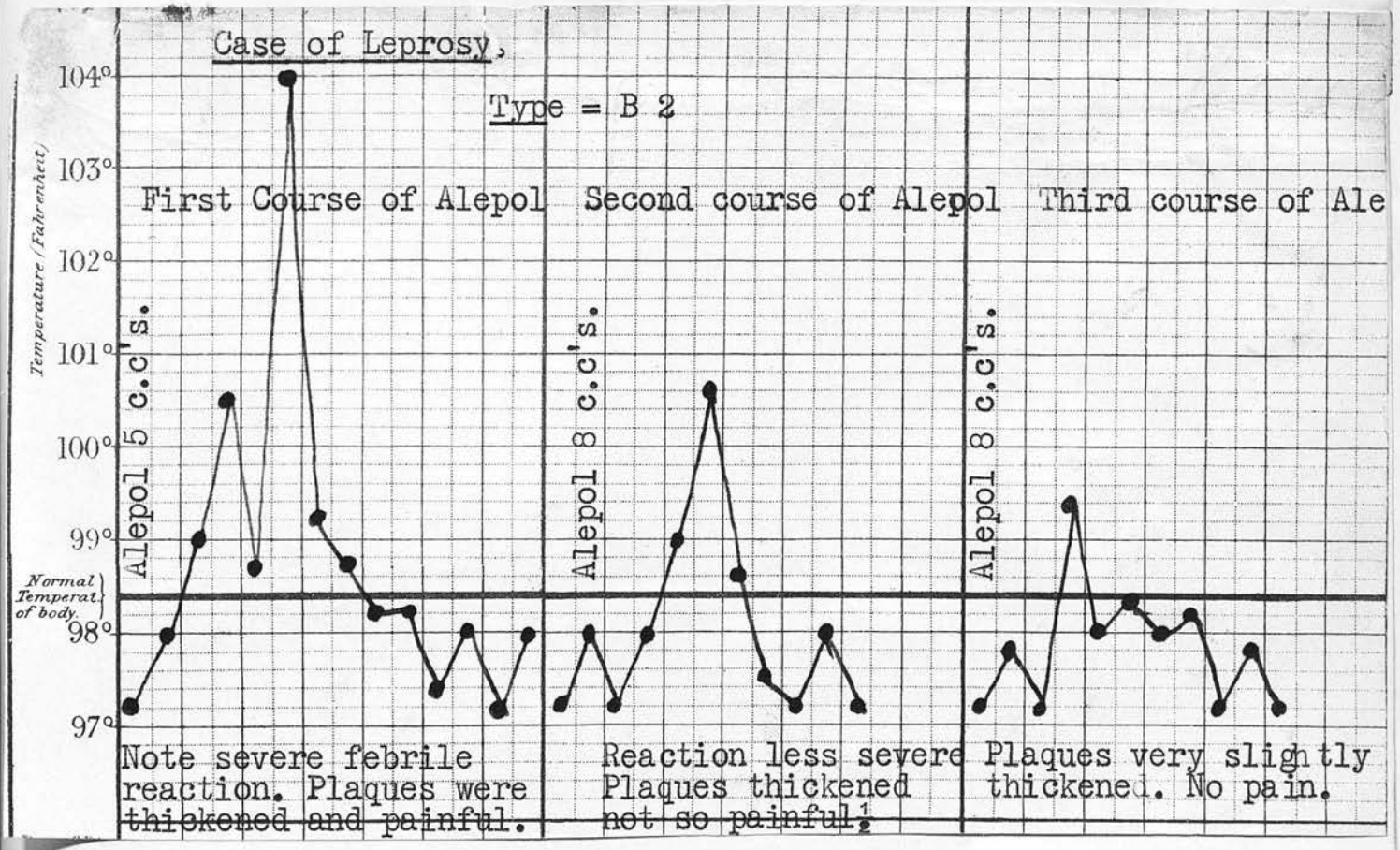
a/ psychological importance. It is impossible to paint a happy picture of the end results in late nerve leprosy.

SKIN CASES.

Reactions to treatment by Alepol in skin cases (BI), are shown by a febrile rise together with bone and joint pains. If there is going to be a reaction it usually commences within twelve hours of the injection. The joint and bones pains may be slight, as they usually are, or extremely severe, as in one case of this type. In every case there was a febrile reaction when 6 c.c. or more was injected. In four out of the six cases the temperature reached IOI F. or slightly higher, although in these cases the temperature came to normal within forty eight hours of its rise. In the remaining two cases the temperature was elevated to IOO F. and came to normal within twenty four hours . In not one of these cases was it found necessary to adopt special measures, either for the relief of pain or to bring down the temperature.

The behavior of the erythematous rashes seen in early skin cases was interesting. In one case within an hour of injection a slight redness was observed around the rash. In the other five this redness appeared within twelve hours of injection. This hyperaemia was noticed to fade


Case of Leprosy.
Type B 1
Tempera
101°
100°
99°
Normal Temperat. of body.
98°
97°
8 c.c's Alepol
Febrile reaction after Alepol. Pain in bones Slight erythematous evanescent rash.
Day of Dis


Case of Leprosy.
Type = B 2
104°
103°
102°
101°
100°
99°
Normal Temperat. of body.
98°
97°
Temperature (Fahrenheit)
First Course of Alepol
Second course of Alepol
Third course of Ale
Alepol 5 c.c's.
Alepol 8 c.c's.
Alepol 8 c.c's.
Note severe febrile reaction. Plaques were thickened and painful.
Reaction less severe Plaques thickened not so painful.
Plaques very slightly thickened. No pain.

fade/ within a few hours of making its appearance and within the next day or two the rash spread over this faded area. In three out of the six cases this change was seen during the first course of injections only; in the remaining three cases it occurred during the first and second courses of Alepol treatment. During the third course in four cases, and during the fifth in two, the erythematous rashes were diminished in extent. After each successive course the rashes were considerably diminished in size. In four cases the rashes had completely vanished after one and a half years treatment, and in two after two years treatment.

These six cases are undergoing further courses of treatment for a year. So far there has been no sign of reappearance of the rashes, neither have the patients had any further bouts of lepra fever. It is hoped that they will continue to do well and that they will be fit for discharge after this further course of treatment. From observations on treatment of BI cases the conclusion arrived at is that treatment, if thoroughly carried out, affords an excellent hope for cure.

In B2 cases after injections of Alepol there is generally a rise of temperature which is

is/ often more marked than in BI cases. In most of these cases there was no rise till a little over twenty fours after injection. The rise was usually slight after the smaller doses and more marked after the larger. The temperature in most cases came to normal within forty eight hours. In two cases when the larger doses of Alepol were administered during the first course of injections, the temperature remained elevated between five and eight days, and it was found necessary to give intravenous injections of sodium antimony tartrate which resulted in the temperature reaching the normal line in a most satisfactory manner.

As an accompaniment of the febrile rise all the patients suffered from bone and joint pains which varied in severity from case to case. In two of the cases where the temperature was normal in forty eight hours, the pains were so severe that they necessitated the use of ephedrine. In both cases the pains were markedly relieved within fifteen minutes of taking the drug, and although they recurred were not severe enough to warrant the repetition of ephedrine.

In seven of these cases though febrile

febrile/ reactions have been less severe after each successive course of injections, yet reactions have been present to some slight extent over a period of one and a half years. For the latter half of the second years treatment there have been no visible reactions. In three cases febrile reactions occurred for only nine months.

Again in most of these B2 cases there has been a reaction in the plaque itself. A day or so after the injection, the plaque is somewhat thickened and is surrounded by a zone of hyperaemia, though this is not seen in all cases. In six cases there was a certain amount of tenderness in the plaque which was most marked towards its periphery in the zone of hyperaemia. In all cases a fine desquamation of the superficial epithelium of the plaque occurred a few days later. Generally, a week later the plaque was less thickened. When the plaque reaction was severe in the form of pain and much thickening, the mid-week injection of Alepol was not given, and the next injection was reduced in amount depending on the severity of the reaction. The reaction in each successive course was less severe.

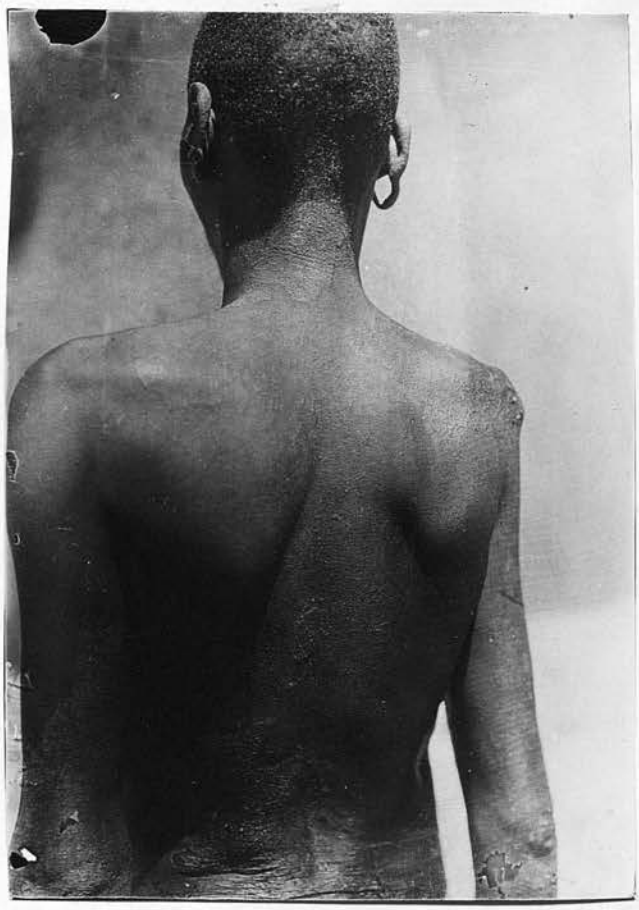
In seven cases there were febrile reactions over a period of a year and a half, the plaques gradually diminished in size and thickness; at the end of this period the plaques were reduced in size by half. In three cases where plaques were small in size, and even greater reduction in size and thickness occurred over a period of nine months.

These ten cases are still undergoing treatment and at the time of writing are not experiencing any febrile reactions, though there is still some reaction in the plaque after injections. There has been decided improvement and it is hoped that after a further years treatment most of the plaques will have disappeared. If this occurs then a further years treatment ought to see a good percentage of cures.

In cases where plaques are small and the patient is responding well to treatment, it might be said that cure is to be looked for with expectation. In others where plaques are extensive the least than can be said is that the outlook is quite hopeful.

The picture following (No. 5.) is of a B2 case under treatment by Alepol injections and local applications of trichloracetic acid. In this case intermittent febrile reactions occurred for one and a half years. The plaques on the back and arms were much more extensive before treatment was commenced and it is believed that the final result will be the complete disappearance of the plaques, leaving only a slightly thickened skin perhaps.

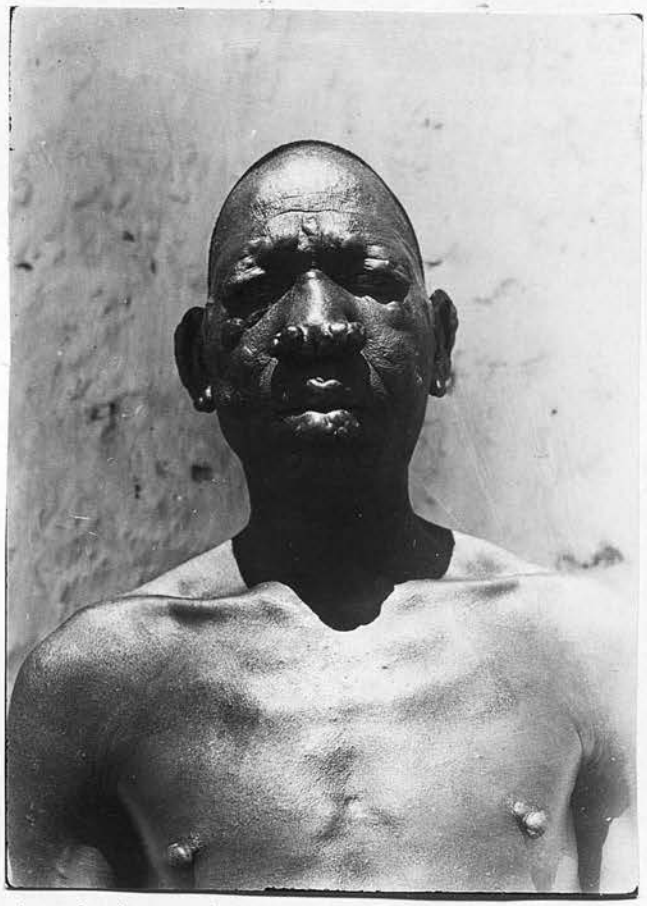
No. 5



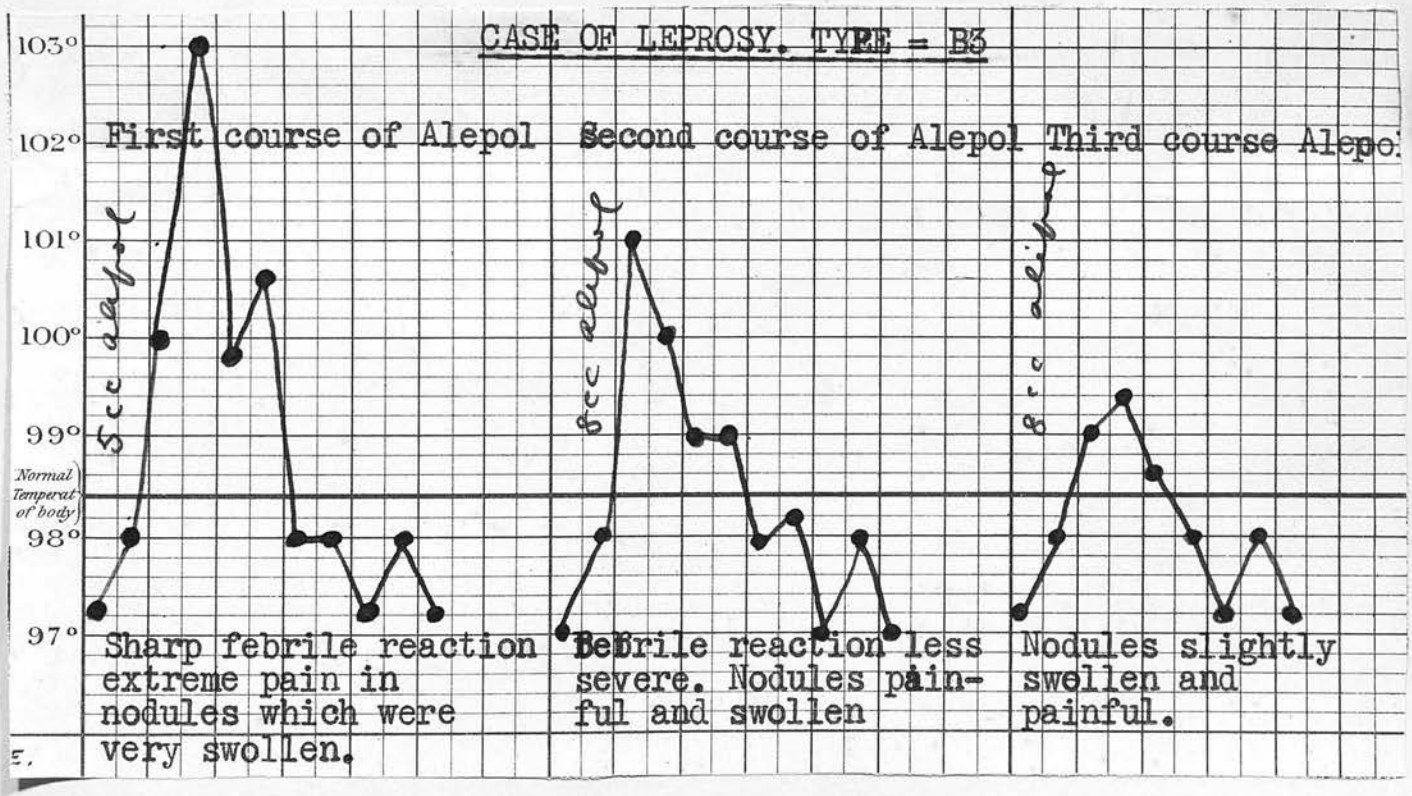
An excellent example of a B2 case. Showing well marked plaques on the back and left arm. Improvement well in progress on Alepol and painting with trichloracetic acid.

Nodular cases of leprosy (B3) react in a somewhat similar manner to Alepol as do B2 cases, except that generally the reaction is more marked. Eight cases of this type have been treated and each one has shown a febrile rise, usually a day after injection. In some cases there was no reaction until the larger doses of Alepol were injected, in others even I c.c. caused a rise in temperature. In three cases where only a few nodules were present, a febrile reaction occurred once during each of three successive courses of Alepol; each successive reaction was less marked and after the third course there were no further attacks of fever. In five cases, febrile reactions resulted once or twice during each course of injections over a period of two years and after this period reactions were absent in four out of the five cases. Reactions of a slight nature occurred in the remaining case, but were few and far between. In none of these cases has the temperature remained elevated for more than fifty hours.

Accompanying the fever are the usual bone and joint pains, and generally these are more severe than in the cases already mentioned. In one case the pains were so severe that the patient



An interesting B3 case showing marked improvement under Alepol treatment. Before treatment his face was a mass of nodules.



patient/ writhed in agony and considerable relief was experienced by him when ephedrine was administered. It was necessary to give two doses of half a grain each before the pains were markedly relieved.

During the elevation of the temperature the nodules get swollen and painful and of a bluish colour. If the reaction has been in any way severe, one or two of the nodules may ulcerate. The aim in treatment is to prevent such severe reactions as may result in ulceration of nodules.

When reactions are extremely severe Alepol is stopped for a fortnight or longer and the injections are recommenced with half the dose which caused the reaction. From this dose increase is carried out in the usual manner. If there is extensive ulceration of nodules even without a sharp febrile rise, the dose of Alepol is reduced and no increase made in the dosage until such time as the ulcer is healed.

As time passes and treatment is carried out a very gradual improvement is noticed, which takes the form of diminution in size of the nodules. However, in cases which have extensive nodule

nodule/ formation, improvement at the best is slow - though it is definitely present. Cases with only slight nodule formation show a much more rapid improvement.

In cases where nodules have been extensive it has been noticed that when they disappear under treatment, a peculiar deep-bluish, bruise-like patch is left in their place. There is one patient here who has improved greated but in whom these bluish patches appear to be permanent.

In one of the patients where the nodules are small, hard and numerous, slight reactions have taken place and after a years treatment there has been no diminution in the size of the nodules. Treatment is still being carried out and no further reactions have occurred. This case may end "arrested", the leonine disfigurement of the face will be permanent, but the nodules, which have probably been encapsuled in fibrous tissue, will not extend nor will they increase in size.

In most B3 cases, the belief is that where there is extensive nodule formation with much fibrosis treatment should prevent any further development of nodules and should, perhaps after

after/ a long course of treatment, result in arrest of progress of the disease. When nodules are extensive and there is not much fibrosis these should disappear completely after a long course of treatment and the condition should completely clear up. In cases where nodules have been less extensive the results of treatment is very promising and it is believed that these cases will resolve completely after a fairly long period of treatment.

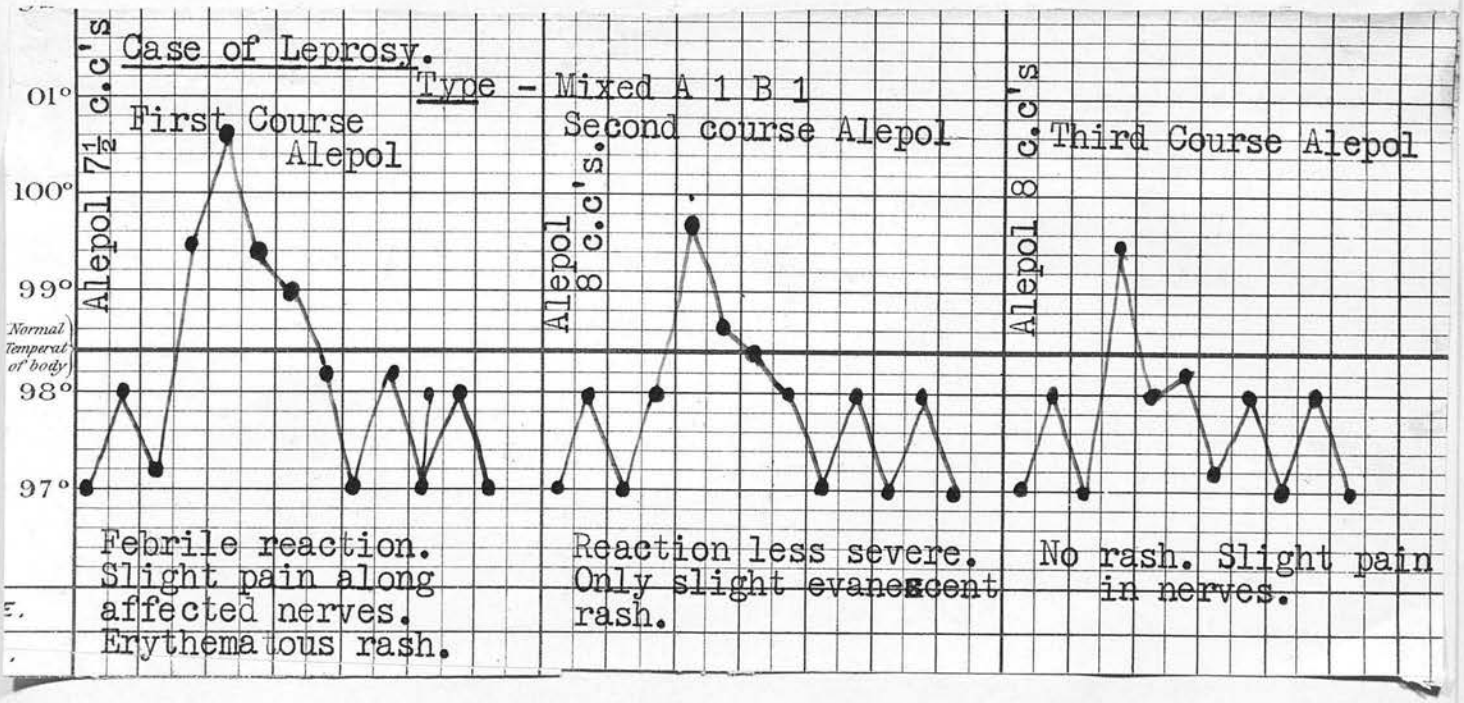
MIXED LEPROSY.

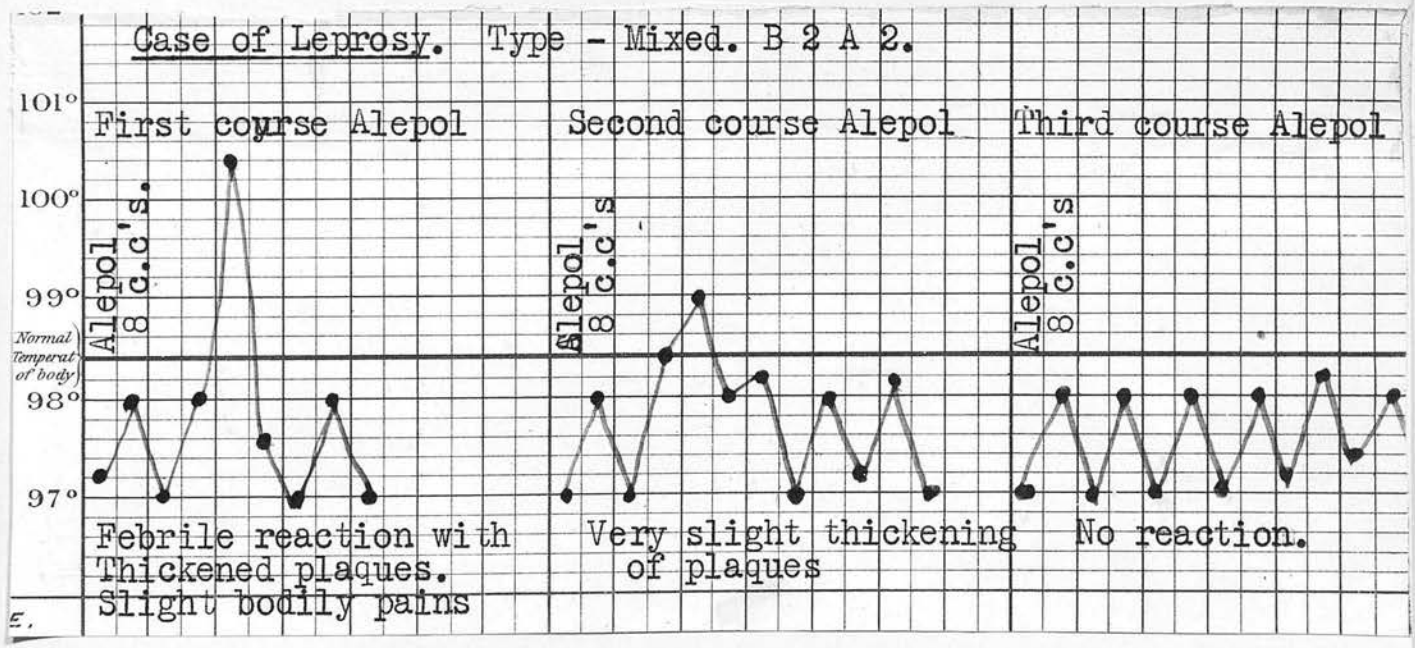
In the treatment of the AIB2 cases the reactions are similar to those seen in each type of case. Nerve pains and joint pains may be present, as well as extension of erythematous rashes. Though symptoms of both types may be seen, this is not always the case. The following chart is interesting. There was a febrile reaction during the first, second and third courses. During the first course accompanying the febrile reaction there was slight pain along the affected nerves, together with marked extension of the erythematous rashes. The reaction during the second course occurred after 8 c.c. of Alepol; it was less severe than in the preceeding course and was accompanied only by the appearance of erythematous rashes. The reactions during the third course were only slight; mild joint pains were experienced by the patient but there was no erythematous rash. All six cases are showing improvement and the hope is for cure. After all signs of the disease have vanished, treatment is to be continued for a year or somewhat longer.

In BIA2 cases the aim is to cure the skin element and arrest the progress of the nerve

nerve/ part of the disease. At the best the result can only be a mutilated individual, but the object of treatment is to cure the BI part of the disease and so to arrest the nerve element that there is a minimum of mutilation. Reactions are similar to those seen in the purely BI cases. Six of the sixteen cases of this type have shown decided improvement in the skin condition after one years treatment. Nine cases have shown only very slight improvement, though this will probably be more marked after further treatment. The A2 part does not appear to have advanced at all. The remaining case was that of an old man who showed no improvement under treatment and ultimately died of broncho-pneumonia.

In B2A2 cases the reactions are like those seen in the B2 cases. There is a rise of temperature in practically every case. In some the temperature is raised after each injection of Alepol; in others, as the chart below shows, there was a febrile reaction during the first two courses of Alepol and in these cases there was no further febrile reaction either during the third or successive courses. Out of the six cases of this type, three are responding well to treatment, the plaques being greatly diminished


Case of Leprosy.
Type - Mixed A 1 B 1
First Course Alepol
Alepol 7½ c.c's
Second course Alepol
Alepol 8 c.c's.
Third Course Alepol
Alepol 8 c.c's
01°
100°
99°
Normal Temperat of body
98°
97°
Febrile reaction. Slight pain along affected nerves. Erythematous rash.
Reaction less severe. Only slight evanescent rash.
No rash. Slight pain in nerves.

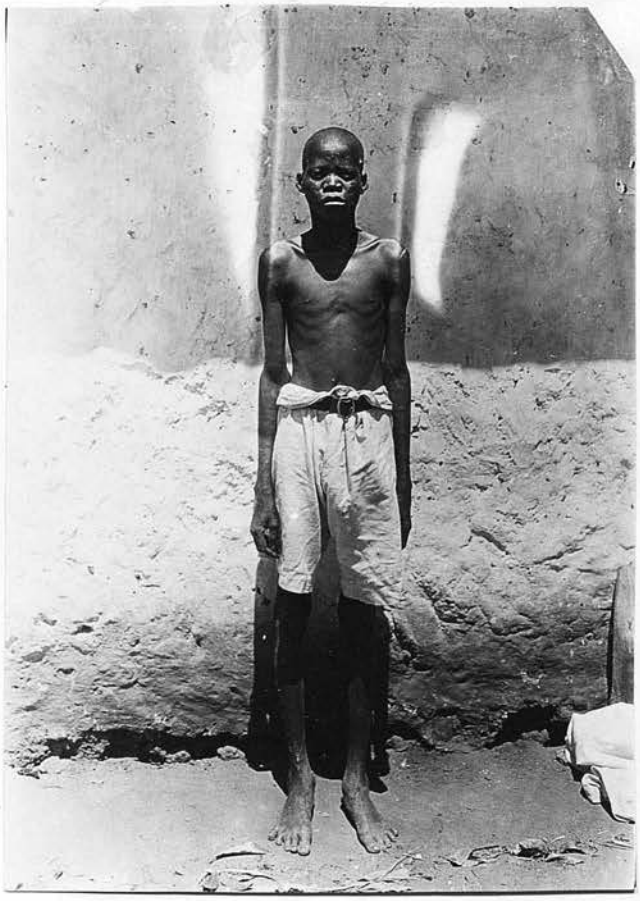

Case of Leprosy. Type - Mixed. B 2 A 2.
First course Alepol
Alepol 8 c.c's.
Second course Alepol
Alepol 8 c.c's
Third course Alepol
Alepol 8 c.c's
101°
100°
99°
Normal Temperat of body
98°
97°
Febrile reaction with Thickened plaques. Slight bodily pains
Very slight thickening of plaques
No reaction.

diminished/ in size and thickness. In one there was a certain amount of improvement, he however, died after an operation for strangulated hernia. One case showed no improvement after two years treatment - he died of lobar pneumonia. One case is advancing under treatment, the plaques getting larger. Here again there has been no advance in the A2 part of the disease. The object is to cure the B2 part and if possible to arrest the progress of the A2 portion.

In the majority of B3AI cases improvement in the skin condition is extremely slow. Where there is extensive nodule formation there is some slow improvement. Where there are only a few scatterred nodules, as in the photograph following (No.7), the end results to be expected are excellent. This patient has shown decided improvement after a years treatment. Before treatment was instituted quite a number of nodules were to be seen about the nose and ears. If this photograph is examined closely a few nodules will be seen around the nose and on the ears. It is believed that this case, and one other of this group, will clear up completely after further courses of treatment. In cases where nodules are of old

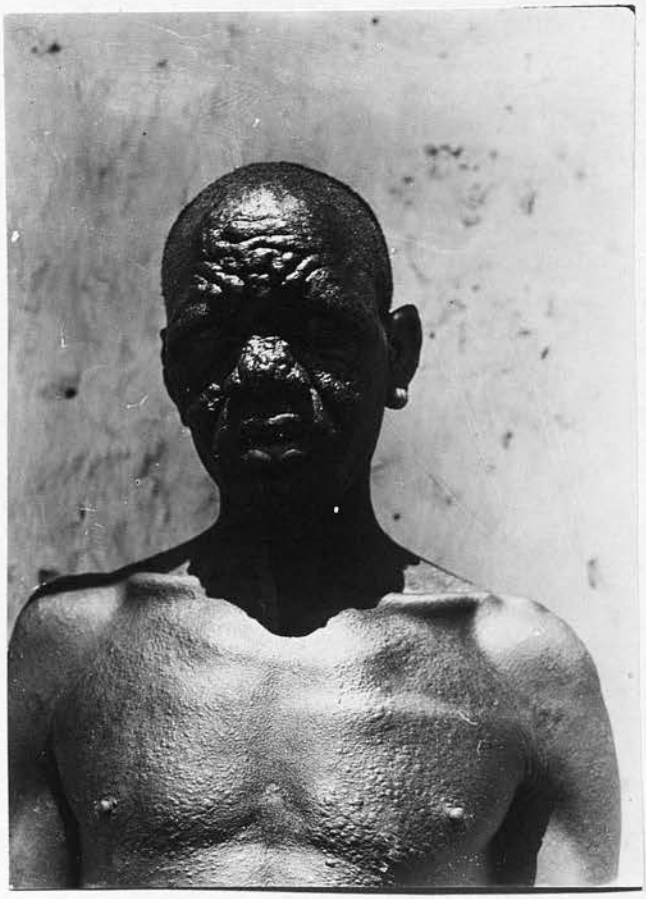
old/ standing and are hard and fibrosed, the only hope of treatment is to prevent fresh nodule formation, and to cure the early nerve part of the disease. Photograph No. 8 is such a case. The patient has had no reactions of any kind for over a year. There has been no formation of fresh nodules and those present are hard and fibrosed. The case is believed to be arrested.

No.7.



B3AI case treated by Alepol injections and trichloracetic acid applications.

No. 8.



B3AI case Nodules of old-standing - hard and fibrosed.

THE ACTION OF ALEPOL.

In I920 Walker and Sweeny (26) published their work on the bacteriological action of the water soluble sodium and potassium salts of the different melting point fractions of the fatty acids of chaulmoogra oil. They added the salts in various dilutions to suitable culture media and then innoculated them with various acid fast bacilli. They found that sodium chaulmoograte had very little antiseptic action, but sodium hydnocarpate and the salts of the lower melting point fatty acids, prevented the growth of organisms is dilutions of I/I,000,000. As a result of this they believe that these preparations might have a direct action on the lepra bacilli in the human tissues. Cummings and Weatherall (27) as a result of their experiments on the inhibitory action of Alepol, came to the conclusion that in vitro, it possesses marked growth inhibitory properties when introduced into fluid medium suitable for deep culture of the tubercle bacillus. Furthermore the fact that two experimental guinea-pigs which were innoculated with tubercle cultures containing Alepol in I/I,000,000 dilution did not develop tuberculosis, suggests

suggests/ that Alepol may also possess a bactericidal property. Read (28) found that hydnocarpates given to dogs in therapeutic doses caused an increase in weight, and an improvement in their general appearance.

Locally Alepol acts as a slight irritant as shown by the slight redness, and perhaps tenderness at the site of injection. The general reaction after the injection may be due to the resistance of the patient being raised by the drug. If this is the case, then Alepol in raising the resistance of the patient places him in a better condition to combat the infection. If the defensive mechanism of the body is much improved by the so called resistance raising Alepol, organisms will be killed and the circulation of these dead organisms in the blood may be responsible for the reaction. Another possibility is that the circulating Alepol may have some action in opening up lepra tissue and this frees numbers of organisms, the lepromalysis of Muir (29). If this is the case then the appearance of the organisms in the circulation will most certainly set up a reaction which will depend for its severity on the numbers of the organisms set free and on the general

general/ resistance of the patient. This view appears to be the most satisfactory.

TREATMENT BY INTRADERMAL INJECTIONS.

The original work on intradermal injections in the treatment of leprosy was described by Philippine workers in the Journal of the Philippine Medical Association of September 1929. The objects of this treatment are to produce counterirritation and so to assist in the absorption of inflammatory products, and also to bring the drug into direct contact with the causal organism in the lesions. It is claimed that by this method there is rapid resolution. The disadvantages are that it is a very painful method and takes a very long time to apply. Plaques and nodules are most suitable for intradermal injections, but if the nodules are very tense they may be surrounded by a ring of injections. The preparations used for these injections are usually the esters, owing to their being less viscous, and more convenient than the oil, but if hydnocarpus oil is heated to 45 C. it loses its viscosity and can be injected intradermally with ease. At present Muir (30) is undecided whether the esters or the oil is more efficacious. The oil when first injected is more irritating, but this irritation passes away more rapidly than that which follows the use of the esters. Sodium hydnocarpate or

or/ Alepol can be used intradermally in I%, 2% or 3% solutions but it is not so effective as the esters or the oil, probably owing to its being quickly absorbed into the general circulation. Muir describes the following technique for intracutaneous injections :- A 5 c.c. syringe with a fine and well fitting needle are used. The area to be infiltrated is sterilised with methylated spirit. The punctures are made about 8 m.m. apart and about half a minim injected at each puncture. When large areas of skin are to be infiltrated the injections may be made further apart. The injection must be made intradermally. Half to five cubic centimetres are given once or twice a week depending on the reaction of the patient: those in good health tolerate larger doses. The best procedure is to start with smaller doses and gradually increase the amount given at each injection. Too large a dose or too frequent infiltrations may lower the patient's resistance, therefore every case must be treated individually and a careful watch kept that the patients resistance is not being lowered by the injections.

In hard and fibrosed nodules the injection of 2 - 4 minims of the oil or ester is made directly into the centre of each. The nodule first

first/ swells up then shrinks. The contents may liquify and then discharge. In cases where lesions are widespread it may take several months to cover all the areas affected.

The writer has no personal experience of this method of treatment which has been so successful in the hands of skilled workers, but there is no doubt that some of the cases of this series would have benefitted greatly by this method of treatment; especially the B3 cases with hard and fibrosed nodules, which remained stationary under other treatment.

MERCUROCHROME SOLUBLE 220 IN LEPROSY.

Denny, Hopkins, Wooley, and Barentine (31) in 1925 came to the conclusion that mercurochrome soluble 220 was not a specific for leprosy but that it had been found helpful in checking rapid retrogression. It had proved useful in the treatment of ulcers and of some help in the healing of trophic ulcers. Rao and Roy (32) reported favourable results in the treatment of twelve cases. Muir and Chatterji (33) treated thirty six cases of leprosy by intravenous injections of mercurochrome soluble 220. They found that there was generally a rise of temperature from one to five degrees above the normal line, depending on the dose of the drug and the sensitiveness of the patient. They found that if 3 or 5 c.c. of a 1% solution were given to begin with, it was generally possible to raise the dose to 10 - 15 c.c. for a patient of 10 stone weight. The dose ought not to be raised if there were any signs of reaction from the previous injection. Some pain in the gums was experienced after the first injection but this did not recur after subsequent injections. Some diarrhoea and vomiting may be seen after 10 c.c. Muir and Chatterji believe that these symptoms are

are/ due, not to the mercury contained in the drug, but rather to some septic focus either in the gums or intestinal tract or both. The subsidence of these symptoms is due to the drug overcoming the infection. In these cases mercurochrome proved a very powerful agent in stopping severe lepra reactions, even more powerful than potassium antimony tartrate. Muir and Chatterji found mercurochrome soluble 220 to be most useful in clearing up septic dermatitis, muscular, joint and nerve pains, and eye infections. In eye cases there was some increase in the symptoms, and although these were temporary, it is advisable to begin treatment with small doses.

Under this treatment there was swelling of the leprotic nodules with abscess formation and bursting - the superficial nodules opening first, the deeper ones liquifying and coming to the surface to burst later. There was a rise in temperature and in the sedimentation index with abscess formation, and a fall of both after bursting. More marked results were obtained with intradermal injections of mercurochrome soluble 220. Liquefaction took place in the nodules not only at the site of injection but also distant from it. In only one of these cases was the patient worse after

after/ treatment. Muir and Chatterji come to the conclusion that this drug may be used with perfect safety in almost all cases of leprosy; but albuminuria and tuberculosis are most definite contraindications to its use. Small doses should be used at first and should be increased according to the tolerance of the patient. Injections may be given weekly, and it has been found that intradermal injections are more powerful than intravenous, in producing abscess formation and liquefaction in the nodules. Such conditions as pyorrhoea, chronic skin conditions, septic ulcers, and lepra reactions clear up in a most satisfactory manner under this treatment.

THE GOLD PREPARATIONS IN LEPROSY.

At the Purulia Leper Colony (34) thirteen cases of different types of leprosy were treated with Solganal B for periods varying from five weeks to three and a half months. Injections were made intramuscularly twice in the week. The initial dose was 0.0I5 gram and gradually increased by 0.0I5 gram at each subsequent injection. The sedimentation test was applied a day before and after the injection and increase in dosage was only made when the resistance of the patient permitted it as shown by the sedimentation index. A progressive increase in the sedimentation index was noticed after each injection and no clinical improvement was seen in any case. Out of these thirteen cases three had severe eye complications - keratitis, iritis, iridocyclitis. There was no improvement in the eye condition even after repeated injection of Solganal B. Even after cessation of injections the sedimentation index rose steadily and the patients were considerably weakened.

Hoffman (35) working in Habana, reports very favourably on the treatment of eye infections due to leprosy (keratitis, iritis, etc.,) with organic gold compounds - Krysolgan and Solganal.

He says that as soon as the first injection is given the patient feels relief, in that irritation of the eyes, photophobia and pain disappear. He reports that ocular complications have become very rare in the Leper Home at Habana since the gold treatment has been applied. He holds that Krysolgan has a stimulating influence on the diseased tissues and increases their antibody formation. The course of injections is commenced with 0.001 gram of Krysolgan dissolved in two cubic centimetres of sterile and distilled water given intravenously. One injection is given every 5 - 7 days, and six or seven injections constitute a course. If found necessary the course may be repeated after 2 - 3 months. In Hoffman's opinion the cure is not only rapid but permanent; the best results being seen with acute inflammatory eye conditions. He believes in giving this treatment when there is the slightest irritation of the eyes. Solganal is a modification of Krysolgan and is usually given in larger doses as it is less toxic.

Rose (36) working in British Guiana considers that the results with Solganal and Krysolgan treatment in leprotic eye conditions are very encouraging.

Robertson (37) advised injections of gold chloride in grains I/20th doses given every ten days for from three to six injections in leprotic eye infections. He believes that these injections will undoubtedly clear up most cases.

In view of these conflicting reports on the gold treatment of eye infections in leprosy great caution is necessary before deciding on the use of these remedies: but it is evident that the results of treatment obtained at the Purulia Leper Colony under carefully controlled conditions, throws serious doubt on the value of these gold preparations in leprotic eye injections.

TRICHLORACETIC ACID APPLICATIONS.

Muir (38) has shown that local applications of trichloracetic acid to macular and noduler skin lesions was a most useful adjuvant to treatment by drugs. He advised its use in dilutions of I in 5 for the face and I in 3 for lesions of the body. Only small areas of skin should be painted at a time, each area being painted once in ten days. In the writers experience in all the cases trichloracetic acid has an irritant action and within a few minutes of its application, burning and a certain amount of itching is experienced by the patient at the site of application. The parts treated are usually somewhat thickened and hyperaemic for a couple of days after treatment. During this time the part gets a peculiar greyish-silver appearance, which lasts for from three to five days; after this there is usually a fine white desquamation. After several applications the areas painted assume a dull blue-grey colour.

BI cases show this hyperaemia with thickening. The greyish-silver colouration is seen, but is not marked. Desquamation is very fine. In this type of case there is no after pigmentation of the treated parts.

B2 cases show a hyperaemia and thickening of the plaques three or more days after the application. The greyish-silver appearance is well marked - much more so than in BI or B3 cases. Desquamation usually starts a week after the application and is somewhat more coarse than in either of the other stages of skin case. After several applications the thickening of the plaque is reduced to a certain extent. Hyperaemia continues to make its appearance after every application of trichloracetic acid. When applied over the nodules of the B3 cases trichloracetic acid causes a certain amount of red-blue congestion together with some swelling. There is only the slightest whitish-grey appearance. Pigmentation afterwards is seen and is of a slate grey colour. In this group of cases (B3) if trichloracetic acid is used in too strong a concentration the nodules tend to ulcerate and at the slightest sign of this the next application must be postponed.

Trichloracetic acid in acting as a counter irritant draws blood to the part and so permits of a freer circulation of Alepol in the lepra tissue. There can be no doubt of its usefulness.

Recently, trichloracetic acid applications have been made over thickened nerves of early nerve leprosy but so far the writer has arrived at no conclusions as to whether this treatment is beneficial in AI cases. Later evidence may be forthcoming to show its benefit.

THE TREATMENT OF ABRASIONS, ULCERS, AND TROPHIC ULCERS

It is the general experience that in leper patients abrasions soon become infected. A slight scratch which in a healthy person would heal without causing any trouble, if not treated immediately in the leper may result in a serious ulcer. Therefore all abrasions in the leper, no matter how slight, are washed carefully with normal saline, dried, painted with tincture of iodine, and then sealed up with compound tincture of benzoin. This method has been found most efficacious in preventing infection of abrasions.

Ulcers in leprosy often cause a great deal of trouble. They do not respond to ordinary measures such as boric fomentations, eusol dressings, or picric applications. The most effective method of treatment is to dress the ulcer daily with crude chaulmoogra oil; under which treatment it generally clears up. Ulcers of the nasal mucosa are often resistant to treatment and general slow in responding to therapeutic measures. In all cases crusts must be prevented from forming and this is most easily effected by applying medicinal paraffin on gauze morning and night. After crusts have been

been/ removed the following prescription is used:-
Two or three drops in the nose twice in the weeK:-

R

Camphor	3 i
Creosote	3 i
Hydnocarpus oil	Oz i
Olive oil	6z ii

Nasal ulcers respond slowly but favourably to these measures.

On no account should trophic ulcers be treated by hot fomentations, as this results in a foul, sloughing, ulcer. These ulcers should be first cleansed with hot permanganate lotion I/5000 and then carefully dried. The ulcer and surrounding skin is then painted with tincture of iodine. If the ulcers are very foul and the above treatment is carried out and when the slough separates, the ulcer is thoroughly dusted with boroiodoform powder and a dry dressing applied. In very resistant ulcers the iodine part of the treatment is alternated with applications of the following:-

R

Iodoform	grs x
Eucalyptus oil	Oz i

Sometimes the eucalyptus oil is found irritating

irritating/ and in these cases hydnocarpus oil is substituted. In some cases iodine is found to harden the skin and in these cases it is as well to use an oily preparation. Sometimes neglected ulcers of trophic origin become infected with maggots. Application of chloroform rapidly kills the maggots which are then removed with forceps. Kerosene acts slower, but is none the less sure in killing the maggots. In cases of trophic ulcers with sinus formation so often seen in the hands and feet, injections of tincture of iodine into the sinus usually results in a rapid healing. Injections may be made every second or third day. A further point of importance is that in some of these cases there is some necrosis of bone; the sequestrum should be removed as soon as possible.

LENGTH OF TREATMENT.

In all cases patients should be under treatment for six months at least, as a bare minimum. In the majority of cases treatment should last longer. In nerve cases treatment should be continued for at least six months after all active signs of the disease have disappeared- though it is more advisable to have these cases under treatment for a year. Skin cases should receive at the minimum a years treatment, and preferably two, after all active signs of the disease have vanished. In noduler cases no claim is made that all the organisms have been destroyed. In these cases treatment often has to be continued for several years. Often the leprotic foci are encased in fibrous tissue and in these cases potassium iodide should on no account be used as a test of cure, for it may result in the opening up of encapsuled foci, which may start up the infection again.

It is extremely difficult to lay down hard and fast rules for the length of treatment. All that can be said reasonably is that the above forms a useful guide. Even after discharge, however, patients should be reexamined every six months for a period.

TEST OF CURE.

After the periods of treatment described in the foregoing pages, the patients are given potassium iodide in large quantities of water. The dose is increased daily until two hundred and forty grains are given in one dose. The following is the method of daily increase :- grains 5,I0,I5,20,30,40, 50,60,80,I00,I20,I60,200,240. The maximum dose is reached in a fortnight, and this dose is given twice a week for a month. If there are no reactions of any kind the case is considered cured. This method is believed to open up any leprotic foci which may be in existence, or which are not efficiently encapsuled. If there are no remaining foci or if the foci are well encapsuled there will be no reaction. This test has been found very useful in early nerve and early skin cases. In this Settlement this method is not used in the late skin cases, in which the absence of reactions and a negative nasal scraping are taken as criteria of cure.

THE SEDIMENTATION TEST.

Fahraeua (37) was one of the first to make observations on the rate of sedimentation of

of/ the erythrocytes in citrated blood. He showed that the rate of sedimentation was more rapid in pregnancy than in the normal individual. He found that the sedimentation rate was increased in "All kinds of infections, most distinct when accompanied by high fever, in many cases of malignant tumours.." He showed that sedimentation was due to the action of haemagglutinins, and that when the cells were agglutinated they dropped down. Haemagglutination depends on the presence of proteins in the plasma, and sedimentation is rapid in pure fibrinogen. The breaking down of the body proteins may therefore account for the increase in the sedimentation index.

The sedimentation test has been used in leprosy by many workers. By this test it is possible to demonstrate a reaction to potassium iodide even when there is no visible reaction in the shape of fever, bone and joint pains,etc.,. It can be appreciated that this is a much more delicate test for cure than the administration of potassium iodide alone. Suppose for instance that the sedimentation index is 25 before the administration of potassium iodide; after its administration it rises to 35 though there was no visible reaction.

It is therefore evident that there must be some focus, probably small, in which living organisms are present, and which focus has not been encapsuled.

The writer has only a very small experience with this test, which however has convinced him of its usefulness in deciding that there has been no reaction after potassium iodide and therefore that the case is completely cured, or completely arrested.

The following are required for the test:- 5% solution of sodium citrate in distilled water. Apparatus - a 2 c.c. hypodermic syringe. 300 m.m. pipettes graduated from above downwards from 0 to 100 with spaces of 3 m.m. between each mark. Rack for pipettes. Rubber corks with small hole into which the point of the pipette is inserted to prevent escape of its contents.

The technique of the sedimentation test used here is that advised by Muir (40) and is as follows :- 0.3 c.c. of the sodium citrate solution is taken into a two c.c. all-glass syringe. 1.2 c.c. of blood from the patients vein is drawn into the

the/ same syringe. A small amount of air in then allowed to enter the syringe; the solution and blood is then thoroughly mixed by reversing the syringe several times. This mixture is then placed in a clean test tube. The sedimentation is carried out in the 300 m.m. pipettes. The blood solution mixture is drawn up into the pipette to the zero mark by a syringe attached to the pipette by a rubber connection. The pipette is then placed in the rack with its point inserted into the small hole in the rubber cork to prevent escape of its contents. The top level of the erythrocytes is read off after one and a half hours, and after two and a half hours. The average of these two readings is taken as the sedimentation index. It will be appreciated from this description that the test is a simple one and therefore makes it possible for a large number of specimens to be tested at a time.

AI cases register a sedimentation index of I6 - 20; this is the same as is found in healthy persons. The test is most useful in skin cases, since by it the amount of infection can be gauged. With few organisms the sedimentation index will be nearly normal. If the organisms are numerous as they

they/ are in B3 cases, then the sedimentation index may reach 60 - 70 , or even higher.

A case may show a sedimentation index of 26 prior to the administration of a reaction-producing drug like potassium iodide. Twelve or more hours after its administration it may rise to 32. This shows that a reaction, though not a visible one, is occurring. Clinical symptoms may or may not accompany reactions to the drug and the change in the sedimentation index may be the only evidence that the patient is definitely reacting to the drug.

Table No.8 shows the results of the sedimentation test in a small number of cases. Before this test was used by the writer, the administration of potassium iodide alone was relied on as a test of cure in suitable cases. After appropriate treatment had been carried out, if there was no visible reaction to potassium iodide in large doses, the case was considered cured. Since this test has been applied it soon became evident that some of the cases formerly considered cured were in reality not so.

Apart from its use as a test of cure the sedimentation index has been considered by Muir (4I) a very reliable criterion of the patients resistance, in that low resistance is shown by a high sedimentation index.

Table 8.

Table showing cases subjected to the Sedimentation test before and after the administration of potassium iodide with results.

Type of case	S.I. before Pot. Iodid.	S.I. after Pot. Iodid.	Results.
AI	22	22	Cured.
BI	I5	I5	Cured.
BI	I8	I8	Cured.
B2	40	48	Further treatment required.
B2	38	45	" " "
B2	42	48	" " "
B3	58	70	" " "
AIB2	20	20	Cured.

POTASSIUM IODIDE TREATMENT.

In their book on leprosy published in 1848 Danielssen and Boeck mentioned that potassium iodide produced both general and local reactions in leprosy, and that this was of value in diagnosis. They considered its general use dangerous and discarded it. Potassium iodide was reintroduced by Muir (42) as a basis for treatment. He (43) advocates its use in gradually increasing doses from one to two hundred and forty grains and controling the reaction which may result by intravenous injections of sodium antimony tartrate. Muir (44) says that after considerable experience with potassium iodide treatment, he would hesitate to give it without the use of the sedimentation test, and then only in cases showing a continuous low sedimentation index.

Cochrane (45) is in agreement with Lowe (46) that the drug is very harmful. The former (47) however lays down the following rules for the giving of potassium iodide, though he does not advise its use as a routine :- Iodides should only be given to the healthy leper; those with flabby muscles and the physically weak should not be given this remedy until their condition is

is/ much improved. Iodides should be stopped at the first sign of weakness - the drug being stopped if there is progressive loss of weight.

At the Dichpali Leprosy Hospital (48) in I928 treatment by potassium iodide was given largely, but the results did not justify its continuation as a general treatment and since March I929 it has been given up except in a few cases. Treatment with hydnocarpus preparations were used during the year. In addition thyreoid extract was used in a large number of cases as a tonic and adjuvant in treatment. The result in this change in treatment was a marked improvement in the general condition of the patients. This has been attributed to the discontinuance of the potassium iodide treatment and the consequent cessation in most cases of severe lepra reactions and fever which weaken the patient.

Treatment with potassium iodide in gradually increasing doses was given a trial by the writer in I929. Twelve so called healthy lepers were so treated. The drug was given orally starting with five grains once in the week and each week increasing the dose by five grains till twenty grains were given. After this ten grains

grains/ are added weekly till sixty grains is taken at one dose. Twenty grains are now added weekly until the dose reaches one hundred and twenty grains; then forty grains, up to two hundred and forty grains, is taken as a dose. The maximum dose is reached in fourteen weeks. After this course the patient gets a months rest during which period tonics are administered. Four such courses were given in most cases.

In cases where severe reactions occurred, treatment was stopped for a month and then recommenced with half the dose which was responsible for the reaction. A reaction was caused by the maximum dose in the early nerve cases, by smaller doses in the skin cases. In the mixed cases the reaction depended on whether the skin or nerve element predominated. In the AIB2 cases the reactions occurred with smaller doses of potassium iodide than in the AIBI case. In the AIB3 case reactions were extremely severe. The reactions took the form of severe bone and joint pains, febrile rise and nerve tenderness.

It will be seen from table No. 9 that large doses of potassium iodide could be given to the AI cases without causing any severe reaction;

Table 9.

Type of case	Reaction caused by number of grains of potassium iodide.			
	1st course	2nd course	3rd course	4th course
AI	240 Sl.	No. R	No R.	No R.
AI	240 Sl.	240 Sl.	No R.	No R.
A2	No R	No R	No R	No R
A2	No R	No R	No R	No R
BI	I00 M	I60 M	240 M	No R.
B2	80 S	80 S	I20 M	200 M
B2	60 S	I60 M	I00 M	I60 Sl.
B3	20 S	20 S	20 S	20 S.
AIBI	I00 M	I20 M	200 Sl	240 Sl
AIB2	60 Sl	80 M	I00 M	I20 M
AIB2	80 M	I20 M	I60 M	I80 M
AIB3	30 S	30 S	30 S	30 S.

R - Reaction. S - Severe reaction. M - Moderate reaction

Sl - Slight reaction.

Cases treated with potassium iodide showing reactions and doses which caused same during first years treatment.

that which occurred took the form of some pain along the affected nerves with complaint of tingling along the nerve. One patient complained of itching along the distribution of the affected nerve; one case had a febrile rise, the temperature being elevated for twenty four hours. In neither of the A2 cases was there any reaction. These two were probably burnt out cases and should not really have been included in this trial.

In the early skin case (BI) there was a moderately severe reaction in the shape of bone and joint pains. There was a rise of temperature which returned to normal within twenty four hours. The two B2 cases showed a somewhat more severe reaction. In both, the temperature was elevated above 102° F. and in both, the temperature reached the normal line within forty eight hours. Both suffered from bone and joint pains and showed hyperaemia of the plaques. In one the plaques were tender.

Reactions in the B3 case were extremely severe. The nodules were swollen and very painful, joint and bone pains were marked. The temperature was elevated to 104° F. and the patient was very weak. The treatment was stopped after the fourth

fourth/ course on account of the severity of the reactions and the extreme resulting weakness.

In the mixed cases the reactions depended on the skin element. The AIB2 and the AIB3 cases react more severely than did the AIBI case.

Both AI cases showed considerable improvement after a years treatment - both cleared up completely. In both these cases there was some slight resulting weakness. No comment is necessary concerning the A2 cases. The BI case was much improved during the first six months of treatment, and there was no sign of the disease after a year. Here again weakness resulted after the treatment. In the two B2 cases both patients were able to tolerate larger doses in each successive course. Improvement, however, was not marked in any way and the patients were very weak after the treatment. It has already been mentioned that after the fourth course of potassium iodide, treatment was stopped in the B3 cases on account of the extreme severity of the reactions and the resulting weakness. In the mixed cases the results depended on the skin element.

These cases are not included in those of

of/ the first part of this paper. They received no other treatment and therefore the conclusions arrived at are based purely on observations of these cases treated with potassium iodide alone. The early nerve cases of this small series of cases benefitted by the treatment, and provided a watch is kept that the patients do not become too weak as a result of treatment, it can be carried out with a certain measure of safety. The BI case responded well, but the B2, B3 and the mixed cases derived no benefit from the treatment.

It is believed that potassium iodide acts by opening up lepra tissue and in so doing allows a freer circulation of blood. It is also believed that organisms are freed and so pass into the circulation where they stimulate an immunity. The fever resulting from the administration of potassium iodide is believed to be due to the liberation of organisms.

From the experience derived from the above series of cases it appears that potassium iodide has only a limited use in the treatment of leprosy, and the greatest caution is necessary when it is used.

CONCLUSIONS.

A study of Table No. IO will show that the writers cases of leprosy treated with Alepol injections intramuscularly , compare favourably in their results with cases treated by other workers by other hydnocarpus derivatives.

From personal experience the writer comes to the following conclusions :-

I. In almost all cases the progress of the disease can be arrested.

2. In many early cases the infection is apparently overcome and no bacilli can be found.

3. In more advanced cases the progress of the disease is arrested, the existing lesions become less, the nasal discharge can be rendered free from organisms, thus much diminishing the infectivity and after prolonged treatment the disease apparently becomes inactive, though some acid fast bacilli can be found in the skin.

4. That every effort should be made to eradicate intercurrent and concurrent affections so that the resistance of the patient may be raised. Such conditions as syphilis, malaria, worm infestations, should receive early and energetic treatment.

5. That the Kahn test is not to be relied on in the diagnosis of syphilis in the leper. Neither is it to be relied on as a test of cure in the syphilitic leper.

6. If possible all early cases should be treated as out-patients. This would only be possible if treatment centres were established near their homes.

7. Compulsory segregation defeats its own ends in that early cases hide themselves away for fear of being incarcerated. Settlements and Leper Homes should be voluntary.

8. Treatment by Alepol injections is certainly beneficial and compares favourably with treatment by other hydnocarpus preparations. (table No.IO)

9. Early nerve (AI) and early skin (BI) cases can be cured and should be given every hope for cure.

IO. Late skin cases (B3) should receive energetic treatment, which must be very carefully watched. Considerable improvement has been observed in these cases under appropriate treatment, and possibly, if the case be not too far advanced, arrest of progress of the disease should take place.

II. That in A2 cases with considerable deformity treatment should be carried out, for it most

most/ certainly aids the natural arrest or burning out of these cases. Those cases with commencing deformities should be energetically treated in the hope that an early arrest will take place.

I3. In mixed leprosy treatment should be arranged as if the case were a pure skin one. Here again results depend on the stage of the skin condition.

I4. Trichloracetic acid applied locally is of considerable value and a most useful adjuvant to treatment.

From a study of the literature the following conclusions are arrived at :-

I5. Treatment by intradermal injections is of considerable value especially in B2 and B3 cases and is specially useful in B3 cases with hard and fibrosed nodules.

I6. Mercurochrome soluble 220 appears to be of great value in clearing up septic skin conditions, eye infections, and is a very powerful agent in stopping severe lepra reactions. Furthermore it appears to be of value in the treatment of leprosy when it is used intradermally or into the nodules.

I7. That Gold preparations, the so called specific for leprotic eye affections, have not been

been/ unequivocally proved of value in these conditions. In view of the conflicting reports great caution should be exercised in the use of these remedies.

I8. From personal observations and from a study of the literature the greatest caution is necessary in using potassium iodide in treatment. It should in any case be used only in specially selected cases.

TABLE 10

This table draws a comparison between personal cases treated with Alepol and cases treated by other workers by Chaulmoogr oil and hydnocarpus oil derivatives.

(49)

Place	Observers	Years	Cases	Apparently Cured	% Cured	Much Improved %	% Improved	Not Improved	Remarks
Manilla	H. W. Wade	1921-25	2990	356	..	..	..	..	Average duration 2.65 yeas
Culion	C. B. Lara	1921-26	6000	629	10.5	..	..	..	Average duration 8 yrs
Honolulu	U. S. Report	1920-24	394	124	31.47	..	..	..	Paroled only 13 relapsed.
Calcutta	E. Muir	.....	203 123	43 38	21.18 31.0	..	..	..	Cases treated 3 month or more. " treated 6 months or more.
Dichpali	I.Kerr.	1923-24 1925-26	180 ?	30	17.0 19.0	45.0. ..	35,0 ..	3. ..	63% became uninfective Discharged improved
Japan	K. Shiga	1921-23	211	23	10.9	14.2.	.	..	.....
Siam	O'Brien	2 years	357	..	..	21.7 23.3	48.6 49.4	29.6 28.2	Duration 1-3 years Duration Plus 3 yrs.
New Caledonia	Genevray	.....	70	6	8.75	31.4	11.4	48.6	90% improved. After 18 months, only five relapsed.
Korea	R. W. Wilson	.....	....	76	..	..	..	..	.....
Calcutta	L. Rogers.	1915-19	51	21	41.2	39.2	17.6.	2	Na hydnocarpate intravenously.
Mombasa	The Writer	1928-31	69	6	8.8	22.2	53.6	4.3	Alepol intramuscularly Duration of treatment 6 months to 3 yrs. 7 arrested cases are not shown as either cured or improved.

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