LEPROSY REVIEW.

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The Association does not accept responsibility for views expressed by the writers. Communications may be sent to the Editor, at 29, Dorset Square, London, N.W.1.

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Editorial.

IN this number of the REVIEW, Dr. Rose contributes an interesting résumé of five years' work in British Guiana. The tables in his article are of extreme interest, as they show in some respects, the difference between groups of cases untreated and treated. It is interesting to note that Dr. Rose prefers as a routine to start treatment by intravenous "Alepol," and Dr. Moiser, in the next article, states that so far, the most effective treatment which has been used is intradermal injections of antileprol. We feel that not only the type of the disease but the results of treatment and the response to the various drugs are dependent on the conditions in the various countries, and, therefore, in order to fully appraise the value of antileprotic treatments, all these must be taken into account. If the conditions in each country where leprosy is endemic were more accurately known, we feel sure a great deal more light would be thrown on the epidemiology of the disease.

Dr. Alfred contributes an article on the Solganol treatment of leprosy and his conclusions are a little more favourable towards this treatment than those come to recently and published in *Leprosy in India*. His doses appear to us to be rather on the high side, and we would once again emphasise that great care must be taken in gold therapy in leprosy, not to increase the doses too rapidly or give too great an amount.

The Leprosy Colony at Itu has developed very remarkably within the last few years, and the description of the work there will be of considerable interest to our readers.

We have reprinted another article by Dr. P. H. J. Lampe on account of the importance of the subject. We are inclined to agree with the conclusion which Dr. Lampe comes to, that a number of cases of clinical leprosy in childhood and early adolescence become arrested spontaneously. If this is so, it is most important with reference to leprosy prevention methods, and the necessity for survey work is increased. Not only does it seem to be essential to estimate as near as possible the actual number of cases of leprosy in each district, but the difference in the type and age of those suffering from the disease should be borne in mind before conclusions are drawn. It is quite possible to imagine an area with a relatively large incidence of leprosy, but if the greater proportion of these cases were healthy adults who had become arrested in the early stage of the disease, then the problem would not assume so great a proportion as if they were children and

adults in the more advanced stages of the disease. We feel that the question of the spontaneous arrest of early symptoms of the disease needs further elucidation. In this connection, Dr. De Langen's work is of importance, for if his test proves that these cases have an immunity to further infections of the disease, this will be a great help in estimating the seriousness of the prevalence of the disease in any given district.

Our readers will be interested in the letter which is published from Dr. Ryrie, of Malaya. His impressions of India are both illuminating and instructive. His criticism of outpatient work in India is worthy of attention, for there is no doubt that while out-patient work is an essential part of any anti-leprosy scheme, one is liable to stress it at times to the exclusion of the institutional work which is more thorough, and where one can put the patient under proper hygienic conditions. The chief drawback to out-patient work in leprosy is that the physician has no control over the home conditions of the patient.

We have reproduced two articles from *Leprosy in India*, one " A Note on Leprosy and Sex," and we feel from our experience in other parts of the world, that providing the environment is similar, there is no difference in the sex incidence of the disease. For instance, we believe that the incidence of male and female cases is about equal in certain parts of Africa where both the men and the women are exposed to the same risk of infection.

We have reprinted Dr. Lowe's article on " Hydnocarpus Oil and its Ethyl Esters," and include his description of making the esters. With the intradermal treatment, ethyl esters are coming more into use again, and some centres away from India may wish to manufacture their own preparations, and, therefore, this description is added.

The British Empire Leprosy Relief Association is willing to supply a limited quantity of iodised esters for the treatment of special cases. We have just received a letter from Southern Rhodesia in which it is stated that the iodised esters are more acceptable than any other form on account of their comparative freedom from pain.

This number of the REVIEW marks the commencement of the fourth volume, and we would wish to convey to all our readers our very best wishes for a successful year's work.

Five Years of Leprosy Work in British Guiana.

A Report to the Medical and Sanitary Committee of the Colonial Office.

F. G. ROSE.

IN 1926, as a result of the report of a Departmental Conference on Leprosy appointed by Surgeon-General Dr. P. J. Kelly, an intensive campaign against leprosy was launched in British Guiana. Five complete years have now elapsed, and the time seems opportune for a review of the work done and the results achieved.

The main lines of action have been three, *viz.*, measures to induce patients to seek treatment early, to ensure segregation of open cases until they are no longer dangerous, and to follow up discharged cases with thoroughness over long periods.

Patients have been induced to seek early treatment by continuous propaganda, by changes in the law, which now only enforces the segregation of open cases, by the establishment of out-patient clinics for the treatment of closed cases and the examination of suspects, and by the provision of increased comforts and facilities for mental and physical recreation at the leprosy hospital.

Propaganda has been carried on by lantern lectures, the distribution of leaflets, and instructions to discharged patients, who play an important part in the discovery of fresh cases, and by surveys in different parts of the country.

By these methods a large measure of success has been achieved.

With regard to legislation, admission to the leprosy hospital has been simplified and the magistrate and police eliminated as part of the legal procedure. Since the new Ordinance was passed in 1931, nearly all the notified cases have been voluntarily admitted; if they are unable to afford the means of transport, their passages are paid by the Government from Poor Law funds.

Closed cases are not compulsorily isolated, though the majority seek admission and are treated for a certain period before becoming out-patients. A Leprosy Board has been appointed which confirms the diagnosis of leprosy in new

admissions, recommends the discharge of arrested or quiescent cases, and also generally acts in an advisory capacity to the Surgeon-General.

The Ordinance also provides for the compulsory removal of new-born children from their parents, if one or both of the parents suffer from leprosy.

Other provisions include compulsory notification and the appointment of a Board of Official Visitors and of a Visiting Justice.

Through the generosity of the British Empire Leprosy Relief Association, which made a grant of £500 for the purpose, leprosy surveys in different parts of the country have been followed by the erection of out-patient clinics, one on the outskirts of the capital city, Georgetown, and another on the outskirts of New Amsterdam, the capital of the County of Berbice. With the out-patient station at the leprosy hospital itself, there are, therefore, three centres at which closed cases may attend as outpatients and discharged cases for examination and further treatment. Special attention is also paid at these centres to examinations of the families of infected persons, a measure on which so much stress is laid by Sir Leonard Rogers.

During the first three months of 1932, there were 147 attendances at Georgetown and 83 at Mahaica. In Berbice, where the clinics are held at monthly intervals, there have been 40 attendances in the two months since the clinic was opened. Many suspicious cases, attending of their own free will, or on the advice of their doctors, have been seen at the clinics, which are clearly fulfilling a real need.

Other measures which are not only adjuvants to treatment but are calculated to make compulsory segregation in the leprosy hospital more attractive, include the provision of facilities for regular out-door exercise and such amenities as cinema entertainments, a wireless receiving set, etc., and the establishment of Scout and Guide troops. Improvements in the diet and in the comforts afforded to the patients in general make life in the institution now far more tolerable, and there is not evinced the same degree of invincible antipathy to segregation as existed in former years. It may be confidently claimed that, as a result of all these measures, we have now a reasonably accurate estimate of the incidence of leprosy among the population.

The chart (facing p. 8) shows that, as was to be expected, the total number of known cases showed a sharp rise from

1926, when the campaign began, owing to the increasing willingness to undergo treatment and the more thorough following up of discharged cases. At the end of 1931 the number of known cases was 477 or about 1·5 per thousand of the total population. This number will naturally show a long continued tendency to increase, since it includes arrested cases who have been discharged whose number is not entirely offset by the deaths, as well as new cases arising year by year. The dotted line in the chart shows the decrease in the number compulsorily segregated, that is, in the number of active cases remaining in the leprosy hospital, from 1925 to 1931.

One of the chief factors in the campaign has been the striking success of the methods of treatment used. After extensive trial, with due controls, of various preparations, a standard method of treatment has been evolved which is, as far as possible, fool-proof and can be left, with adequate supervision, in the hands of unqualified assistants. This consists of a preliminary course of alepol in 5 per cent. solution intravenously in mixed and pure cutaneous cases, followed by intramuscular injections of pure hydnocarpus oil or its esters. The intravenous injections are given bi-weekly until a dose of 10 c.c. is reached. Sometimes it happens that severe attacks of fever and ague follow these injections, in which case it is necessary to change to oil or esters sooner. Thereafter the oil or esters are injected intramuscularly, or intradermally as well in suitable cases. The oil in our hands gives the best results, but occasionally it becomes necessary to change to esters.

When a dose of 15 c.c. is reached, or in children 10 c.c., the injections are given once in two weeks, this being regarded as the maximum dose, until six consecutive monthly examinations have proved negative, when the patient comes before the Leprosy Board for discharge on parole. After such a discharge, the patient is given monthly intramuscular injections of 10 c.c. of oil or esters for an indefinite period, monthly bacteriological examinations being also made. In cases of the neural type intramuscular injections of oil are given from the outset. Local treatment consists of the application of trichloracetic acid in suitable dilution and of pencils of solid carbon dioxide. Minor surgical operations, such as the excision of isolated nodules, trimming off of the enlarged lobes of ears, peri-arterial sympathectomy as practised by Py and Riveros[1] for the relief of trophic ulcers, tendon-lengthening, etc., have been frequently performed under local, and in the case of sympathectomy spinal

anæsthesia with novocaine and adrenalin, and have a distinct sphere of usefulness.

The electrical department is equipped for treatment by ionisation, faradisation, high-frequency and diathermy currents, and ultra-violet radiation, and is of great benefit in commencing contractions of the fingers and toes, the treatment of nasal lesions[2] and the relief of generalised thickening of the skin.

In addition the oil and esters used for injection are exposed at a distance of 12-in. for one hour to ultra-violet radiation from a mercury-vapour lamp. Since this procedure was adopted our results have been uniformly good with oil from H. Wightiana and Taraktogenos Kurzii. The injection causes little pain, and abscess is a comparatively rare complication. The weight-chart is an invaluable guide to dosage. The dose is increased by 1 c.c. each time to the maximum as long as the weight increases. If the weight diminishes by less than 2 lbs. or remains the same, the same dose is repeated; if there is a loss of 2 lbs. or more, the dose is reduced by 1 c.c. One need hardly add that the weight is always taken at the same time of day, under as nearly as possible the same conditions. By following this method one avoids almost entirely those severe and sometimes fatal reactions which so often impede treatment. So valuable has this guide to dosage proved that a weighing-machine is considered an indispensable adjunct of all out-treatment centres.

The accompanying tables show the results in the cases, 491 in number, which have undergone treatment during the past five years.

The terminology used is that recommended by the International Leprosy Conference at Manila.

Table I gives a general view of the results in all cases.

TABLE I.

RESULTS OF TREATMENT IN ALL CASES, 1926-31.

Number Treated	491	
Arrested	128	
Quiescent	132	
Subsiding	101	
Total improved	361	(73·5 per cent.)
Stationary	18	
Worse	17	
Died	95	(19·3 per cent.)

Table II shows the results in early cases, Table III in the more advanced.

TABLE II.

EARLY CASES, CUTANEOUS AND NEURAL.

Type of Case.	*No. Treated.*	*Arrested.*	*Quiescent.*	*Subsiding.*	*Total Improved.*		*Stationary.*	*Worse.*	*Died.*	
					No.	*Per-centage.*			*No.*	*Per-centage.*
C1 ..	33	6	19	5	30	90·9	—	—	3	9·0
C1N1..	17	2	8	4	14	82·4	—	—	3	17·6
C1N2..	5	2	1	—	3	60·0	1	1	—	—
N1 ..	48	13	18	14	45	93·8	2	—	1	2·1
N2 ..	91	41	27	8	76	83·5	2	2	11	12·1
Total..	194	64	73	31	168	86·6	5	3	18	9·3

TABLE III.

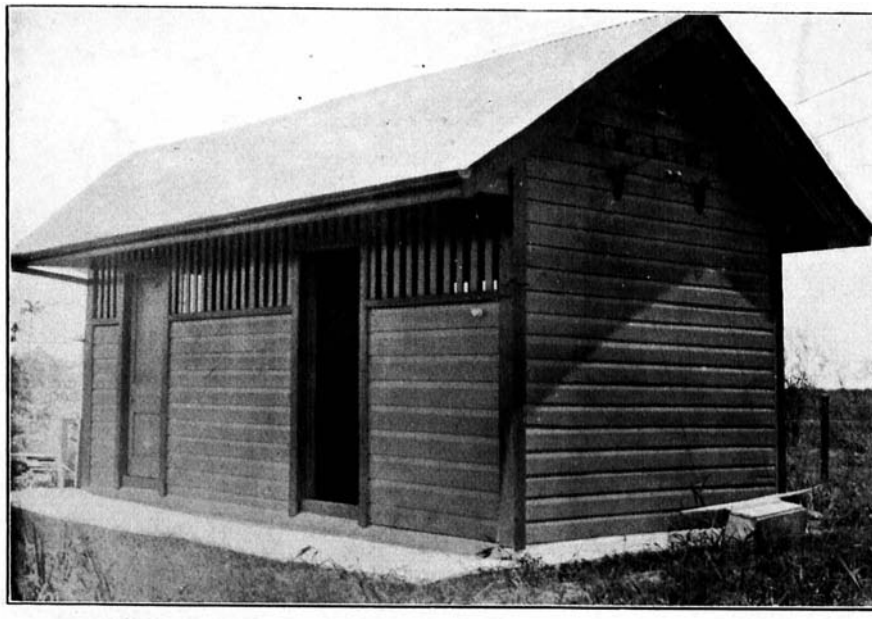
ADVANCED CASES, CUTANEOUS AND NEURAL.

Type of Case.	*No. Treated.*	*Arrested.*	*Quiescent.*	*Subsiding.*	*Total Improved.*		*Stationary.*	*Worse.*	*Died.*	
					No.	*Per-centage.*			*No.*	*Per-centage.*
C2 ..	79	8	29	23	60	75·9	5	5	9	11·4
C3 ..	54	1	2	22	25	46·3	2	3	24	44·4
N3 ..	86	50	10	1	61	70·9	1	2	22	25·6
C2N1..	22	3	7	7	17	77·3	0	2	3	13·6
C2N2..	17	1	3	4	8	47·1	1	2	6	35·3
C3N1..	12	0	2	6	8	66·7	0	0	4	33·3
C3N2..	9	0	2	3	5	55·5	1	0	3	33·3
N3C1	12	0	2	4	6	50·0	2	0	4	33·3
N3C2..	2	0	1	0	1	50·0	0	0	1	50·0
Secy. Neural	4	1	1	0	2	50·0	1	0	1	25·0
Total..	297	64	59	70	193	65·0	13	14	77	25·9

Table IV, showing the results in 116 untreated cases, is given for comparison.

Except for the absence of special treatment, they lived under exactly the same conditions.

Six early cases died of intercurrent disease before treatment could be instituted and are, therefore, omitted from the Table.



VIEW OF ONE OF THE OUT-PATIENT CLINICS, BRITISH GUIANA.
(Erected by the British Empire Leprosy Relief Association.)

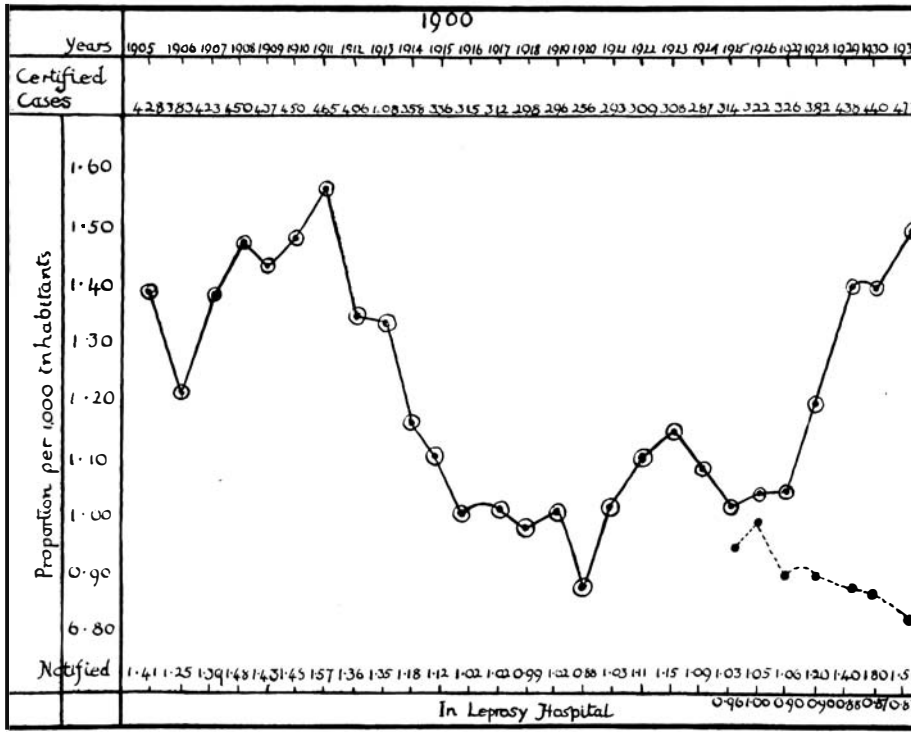


CHART SHOWING THE INCREASE IN THE NUMBER OF NOTIFIED CASES IN BRITISH GUIANA (PLAIN LINE) AND DECREASE IN THOSE IN THE LEPROSY HOSPITAL (DOTTED LINE).

A Group of Patients at Itu, Nigeria.

TABLE IV.
UNTREATED CASES.

Type of Case.	*No. Treated.*	*Arrested.*	*Quiescent.*	*Subsiding.*	*Total Improved*		*Stationary.*	*Worse.*	*Died.*	
					No.	*Per-centage.*			*No.*	*Per-centage.*
C2 ..	8	—	—	—	—	—	—	—	8	100·0
C3 ..	18	—	—	—	—	—	—	1	17	94·4
N1 ..	3	1	—	—	1	33·3	—	—	2	66·7
N2 ..	14	4	—	—	4	28·6	2	—	8	57·1
N3 ..	63	31	3	—	34	54·0	—	—	29	46·0
C2N1..	2	—	—	—	—	—	—	—	2	100·0
C2N2..	5	—	—	—	—	—	—	—	5	100·0
C3N2..	3	—	—	—	—	—	—	—	3	100·0
Total..	116	36	3	—	39	33·6	2	1	74	63·8

In comparing the Tables it has to be borne in mind that the cases in Table IV are nearly all cases arising prior to 1926, since every case now admitted without exception undergoes treatment.

Nevertheless, the Tables demonstrate unmistakably the fate of the untreated patient and the encouraging outlook for the early case under treatment.

Table V shows the number of positive cases who have become negative after treatment, some of whom (neural cases) had been positive in the nasal mucous membrane consistently for some ten years or so previously. *No positive case has been observed to become negative without treatment.*

TABLE V.
POSITIVE CASES BECOMING NEGATIVE AFTER TREATMENT.

Type.	*Number of Positive Cases Treated.*	*Number becoming Negative after Treatment.*	*Percentage.*
C1	33	26	78·8
C2	79	38	48·1
C3	54	3	5·6
N1 ..	4	3	75·0
N2 ..	4	3	75·0
N3 ..	8	6	75·0
C1N1 ..	17	9	52·9
C1N2 ..	5	3	60·0
C2N1 ..	22	7	31·8
C2N2 ..	17	4	23·5
C3N1 ..	12	3	25·0
Total ..	255	105	41·2

Some of the cases admitted in 1931 had been receiving treatment for only a few months before this report was compiled, so that the results are even better than they appear on the surface. With regard to the vexed question of recurrence, 14 arrested cases relapsed at various times, but at the time of writing only six have failed to recover, and are still in hospital under active treatment. That is to say, there are now only six relapses out of 128 arrested cases, a proportion of 4·7 per cent., which cannot be considered other than highly satisfactory. The " follow-up " is particularly complete. Each case is examined monthly at one of the clinics after being discharged on parole. The attendance on the whole is regular and there are only two cases in the whole series whose future history is unknown. The results may, therefore, be taken as presenting a high degree of accuracy.

It remains to enquire what effect, if any, this work has had on the incidence of the disease in the Colony.

To this end, Table VI has been compiled, showing the notifications from 1907 to 1931.

The yearly average over five-yearly periods has been taken because it happens that in the past patients did not seek admission as a rule in the year that the disease first made its appearance.

During the last four years the notifications also include out-patients in an early stage who were not seen heretofore until the disease was comparatively far advanced.

TABLE VI.

NOTIFICATIONS FROM 1907 TO 1931.

Year.	*Annual Average of Notifications of Five-Yearly Period.*	*Persons Suffering from Leprosy Repatriated to India.*
1907-1911 ..	109·0	73
1912-1916 ..	63·8	35
1917-1921 ..	66·8	47
1922-1926 ..	61·6	24
1927-1931 ..	56·2	6

The period 1912 to 1916 includes a period when the policy was adopted of only admitting open cases to the leprosy hospital. This policy fell into abeyance later, with the result that the number rose again to some extent in the next period. Moreover, from 1907 to 1926, 179 patients were repatriated to India. There can be no doubt that the

measures taken during the past years have materially reduced the incidence of the disease. This is illustrated in another way by the fall in the daily average number treated year by year in the leprosy hospital from 288·8 in 1926, to 260·7 in 1931.

A further point of interest which clearly illustrates the value of modern methods of treatment is the fact that of 81 cases discharged in 1931 as arrested or quiescent, over 68 per cent. were free from the stigmata of the disease, and only three were unable to earn their living without help from Poor Law funds. These three, moreover, were cases of spontaneous arrest without treatment.

Reference may be made to four new developments now under consideration which will undoubtedly render the campaign against leprosy still more effective. There seems no doubt that the infection is generally contracted in childhood. The more one gets hold of early cases, the greater becomes the number of children admitted. These children, for whom no special accommodation is available, are thrown perforce from a tender age into unfitting surroundings, living among adults, many of them drawn from the lowest classes, and some of them grossly deformed and mutilated. His Excellency the Governor, Sir Edward Denham, was so strongly impressed with this fact on his first visit to the hospital, that he proposed the erection of a separate building for children of a tender age. Owing to financial conditions, however, Government found it impossible to proceed with the work and the British Empire Leprosy Relief Association was approached for a grant for the purpose. The Association, however, found it impossible to accede to the request.* The matter, therefore, remains in abeyance until a visitor from England, a member of the Galton family, and a cousin of the late Roman Catholic Bishop of the Province, greatly impressed with the necessity, expressed her intention on returning to England of endeavouring to raise the funds from private sources, with every hope of success. Secondly, a scheme is being considered to collect the old deformed neural cases scattered about the villages, and in receipt of Poor Law relief, as well as some few who remain in the leprosy hospital, into a leprosy colony in a remote part of the country.

A British Guiana Branch of the British Empire Leprosy Relief Association begun to function in 1931. His Excellency the Governor honoured the Branch by becoming its President, the Surgeon-General being one of its Vice-Presidents,

* A grant of £300 has just been made.—EDITOR.

and to one of its sub-committees has been entrusted the task of considering this scheme for a leprosy colony. Thirdly negotiations are now under way, with every prospect of success, for the engagement of religious sisters to work in the leprosy hospital, a development which is bound to be of great importance owing to the inadequacy of the nursing facilities hitherto available. Lastly, Lady Denham, wife of His Excellency the Governor, seeing that there was no machinery for continuing the education and training outside the leprosy hospital of children in whom the disease had become arrested, and sympathising with the wretched plight of children whose parents had contracted the disease, conceived the idea of a Home, in which such children, of whom there are over 30 at present, could be maintained, educated and trained to earn their livelihood in useful ways. With this end in view, Lady Denham is accumulating funds from private sources and has already collected a substantial nucleus. The committee in charge of the arrangements have decided, very fittingly, that the Home should be called The Lady Denham Home for the Protection of Children from Leprosy, and it is hoped that the coming year will see the initiation of this splendid enterprise. The leprosy hospital has thus been very fortunate in its benefactors, and, last but not least, the writer wishes to acknowledge the support and sympathy of the Honourable Dr. P. J. Kelly, to whom the initiation of the campaign is due and without whose help the measure of success already achieved could never have been obtained.

It remains to be added that the work has been carried on without any additional cost, rather the reverse, as the following table shows :—

Year.	*Actual Expenditure of Leprosy Hospital, except Medical Superintendent's Salary and Emoluments.*	*Revenue.*	*Nett Cost of Upkeep.*
	$	$	$
1926 ..	42,128,31	501·46	41,626·85
1927 ..	42,560·57	920·92	41,639·65
1928 ..	40,503·86	1052·66	39,451·20
1929 ..	38,740·04	1123·98	37,616·41
1930 ..	37,766·14	1048·34	36,717·80
1931 ..	32,319·04	1182·95	31,136·09

This in spite of the fact that hydnocarpus oil as well as other drugs has to be supplied not only to the inmates of

the leprosy hospital, but to all the 500 odd patients who are under treatment. Under this head some relief will be obtained when our hydnocarpus trees have arrived at maturity. Of these, we have over 40 at the leprosy hospital, and four in the North-West District. A few of our trees have fruited, and the seeds have been handed to Mr. Follett-Smith, Government Ecologist, at his request, for planting by the Potaro Road in the interior of the Colony.

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[1]Py (C) and Riveros (MO) 5a Reunion Society, Argentina Patol Reginal del Norte, Jujuy, 7 al 10 Octubre, 1929. Vol. I, pp. 408-419. Reviewed in *Tropical Diseases Bulletin*, 1930. December, Vol. XXVII, No. 12, p. 1004.

[2]Rose, F. G. B.M.J., January 26th, 1929.

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A Description of the Work at the Leprosy Hospital at Ngomahuru, Southern Rhodesia.

BERNARD MOISER.

THERE are now well over 400 patients in this hospital, the bulk of them being voluntary. They all live in the place in five villages, there being no out-patients, and treatment is carried out at the hospital, which is centrally placed within the 8,400 acres comprising the hospital grounds. The whole area is bounded by a wire fence, the use of which is to keep out cattle and other straying animals, and to keep in the slaughter cattle, which are bought in lots of 50 or so, and kept in the place until required. In arranging the patients in the villages, all open cases are housed in one village by themselves, whilst in the remaining four, consideration is given to tribal and sex differences, so that there is (1) single indigenous village; (2) single foreign; (3) married indigenous; (4) married foreign. Single unmarried girls live in the married quarters.

The patients are allowed to have visitors, who are housed in a separate compound, and who are not permitted to stay longer than a week, their names and dates of arrival being entered in a visitor's book. This system of visitors is one which is very much appreciated by the patients and is not

abused in actual practice. It is found that visitors come from as far as 200 miles. There are seldom more than half a dozen at one time. It is found too that visitors generally come to report some kind of trouble which has occurred at home, about which they wish to consult the patient, and they generally stay only a night or two.

Another system which is also very much appreciated is that of writing letters for the patients to their relatives and friends. This keeps them in touch with their homes, and serves a most useful purpose in producing a feeling of contentment. The natives of this part of Africa possess a close family bond, and are very fond of their children, of whose welfare they are most solicitous. In actual practice some 25 to 30 patients' letters are posted every week, and travel post free, being merely stamped with the office stamp.

Exercise is considered most important. The patients both male and female are arranged in gangs and are employed for four mornings in the week from 7.30 to noon on any kind of work which is required to be done and for this they are paid 1d. a day. They make bricks (receiving for this work 2d. a day as this is hard work), construct roads, build houses, plant trees and avenues and tend these, sweep compounds, make beds and chairs, do blacksmithing, grow vegetables in a large common garden, etc. In the afternoons they are left to do what they please, and generally spend the time on their own small farms, and in trapping wild animals.

The children attend a school every afternoon from 2 to 4, and there is also a sewing class under the supervision of the Matron where clothing is made, and it is found that a great deal of expense is thus saved.

Mealie meal is issued once a week (about $1\frac{3}{4}$ lb. per head per day), and about $\frac{3}{4}$ lb. of fresh meat is given out twice weekly. Vegetables are issued daily, and play a very important part in the dietary. Leave of absence is granted at intervals, the patient, if not in an infective state, being allowed to visit his home for a fortnight, or even longer if considered desirable. These visits occur during the intervals of treatment.

Missionaries visit the hospital frequently, holding services which are well attended, and administering the Sacrament to those desiring it. So much for general routine.

Treatment.

The drugs used here are alepol, esters in the form of Bayer's antileprol, E.C.C.O., and hydnocreol all given

intramuscularly, or intradermally. Externally, a liberal use of trichloracetic acid is employed, and chaulmoogra oil is applied to areas which have been treated with the acid.

Of the above, antileprol is considered the best, but it is too expensive for continuous use. It is given intramuscularly and intradermally in increasing doses up to 5 c.c. Injections are practically painless, and seldom cause abscesses. Alepol has the great merit of being cheap. It is used in 6 per cent. solution, instead of the usual 3 per cent., since this keeps down bulk, and it is found to be well borne, up to a point, when the patient shows signs of saturation by failing to absorb the injection, and by showing a tendency to abscess formation, of a non-septic type. Septic abscesses also are not uncommon. At the end of a course of alepol, it is not unusual for me to be called to the dressing shed to open abscesses. This very seldom happens with antileprol, which is much preferred by the patients themselves. Injections are given twice weekly, until the patients show signs of saturation by failing to absorb, or by abscesses.

For purposes of comparison, a dozen patients have been treated with continuous alepol, another dozen with continuous antileprol, and another dozen with these two alternately for six to eight weeks, that is alepol for six to eight weeks, followed by antileprol for a similar period, with an interval of one to two weeks in between. Results are not strikingly different, but certain facts have been ascertained.

Continuous alepol produces a tendency to abscess formation. It becomes increasingly painful. The disease is controlled fairly well. Continuous antileprol does not lead to abscesses, and does not become increasingly painful. The disease is controlled equally well, if not better.

The alternation method shows slightly better results than either of above. Ulcers appear to heal more rapidly and the disease is controlled to a greater degree. If expense were of no consideration, I should use antileprol and alepol alternately as a routine. I am of opinion that antileprol is much more effective when given intradermally. It is the practice in this hospital to give intradermal injections only into nodules and infiltrated areas, and not into hypopigmented areas, unless the edges are very much raised and papulated. In the one and only European case here, of type N_1C_2 intradermal injections have had to be discontinued entirely since the patient always felt faint, and broke out into a cold sweat. Intramuscular injections cause no discomfort whatever. This patient has been here for nine months' on continuous antileprol, and has improved very much indeed.

He has only slight neural symptoms in one ulnar, and these have definitely ameliorated, but he has extensive macules and small nodules, many of which have already faded completely. His local reactions are small, if noticeable at all, and he has not yet had any general reaction.

E.C.C.O. and hydnocreol have not been used on a large scale, because it was found that the fluid had to be evacuated on many occasions. Especially was this so with hydnocreol. It was not absorbed, and the evacuated fluid showed little or no change from the original fluid.

Mention has been made of trichloracetic acid, and great faith is attached to it. I believe the best way of treating nodules and infiltrations of ears, is to destroy them completely with repeated applications of the acid, using chaulmoogra oil locally at the same time. I have several striking results from this method, as shown by the photographs of Gwawiya. This boy will do anything to get hold of trichlorcetic acid ! It is used in strength of one in one or one in two for destroying nodules. The areas heal well, but with a hypopigmented scar.

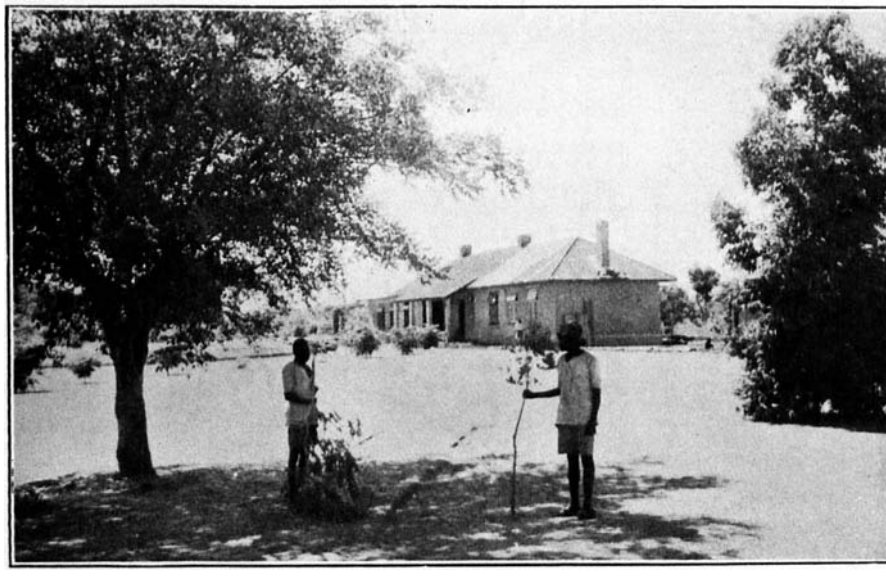
I would like to take this opportunity of placing on record the very generous gift of the B.E.L.R.A., to this hospital, of a most helpful water supply. Formerly one had to be content with a basin and a jug of water in the hospital, but thanks to the B.E.L.R.A., we now have hot and cold water laid on to the treatment room, laboratory, dispensary, and dressing shed, as well as to the staff quarters.

Solganol in the Treatment of Leprosy.

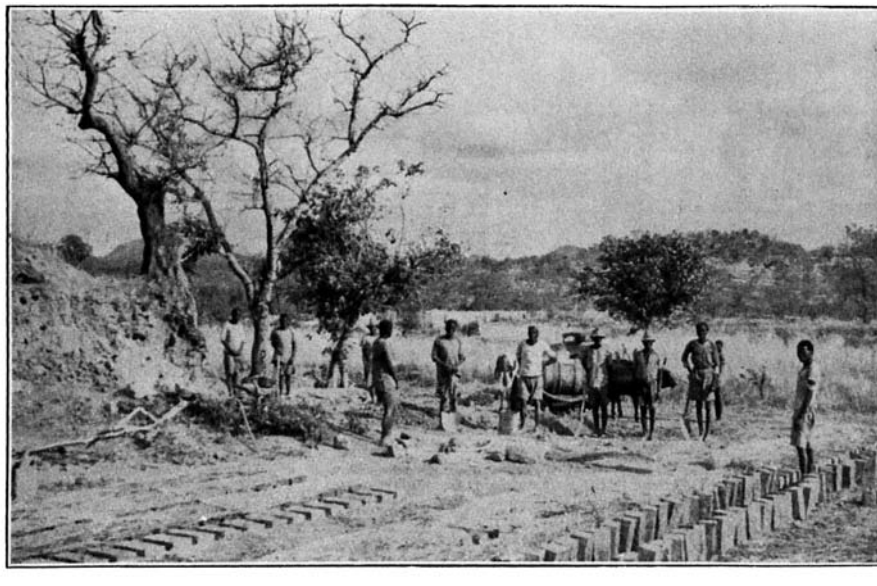
E. S. R. ALFRED.

A SUPPLY of Solganol and Solganol B, both gold preparations, manufactured by Messrs. Schering-Kahlbaum A.G., Berlin, were sent to us through Dr. R. G. Cochrane and Dr. A. N. Kingsbury, for trial at the Federal Leprosy Settlement, Sungei Buloh.

The preparations are dissolved in the solvent (normal saline for the first dose and distilled water for the others) provided by the manufacturers, and the solution injected, Solganol intravenously and Solganol B intramuscularly. The course comprised 15 doses given at intervals of a week. The dosage was as recommended by the maker, *viz.* :—



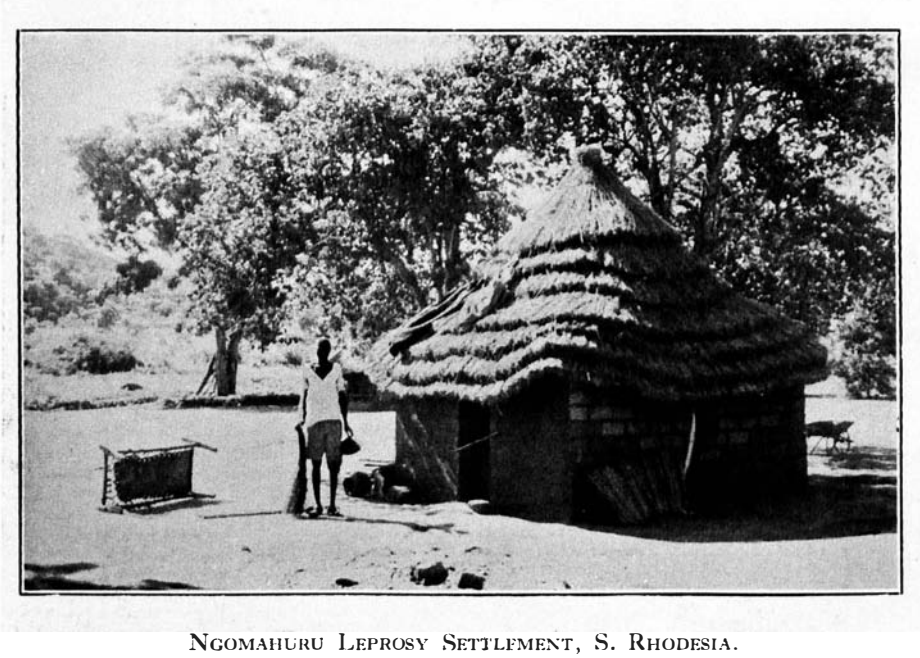
NGOMAHURU LEPROSY SETTLEMENT, S. RHODESIA.
Patients Sweeping the Hospital Compound.



NGOMAHURU LEPROSY SETTLEMENT, S. RHODESIA.
Brick Making by Patients.

BEFORE AND AFTER APPLICATION OF TRICHLORACETIC ACID.

(Boy Gwawiya mentioned in Dr. Moiser's Article.)



NGOMAHURU LEPROSY SETTLEMENT, S. RHODESIA.

A Village Headman.

Also shows a wood and hide bed made locally by the gang of carpenters. Each patient is supplied with a bed.

	Gramme.		Gramme.
1st day	0·1	57th day	0·1
8th "	0·1	64th "	0·25
15th "	0·1	71st "	0·25
22nd "	0·025	78th "	0·25
29th "	0·05	85th "	0·5
36th "	0·05	92nd "	0·5
43rd "	0·1	99th "	0·5
50th "	0·1		

The cases selected were chiefly for leprous lesions of the eye, *viz.*, iritis, corneal ulceration, phthisis oculi, etc.

The attached Table gives full details as to the type of cases, number of injections given and the amount of the drug administered and the results of the treatment.

Ten cases completed the treatment. Of the remaining five, one had repeated attacks of acute conjunctivitis, and had his treatment interrupted on this account. He eventually refused any more injections after the eleventh dose. One had increasing numbness of the lower limbs and stopped after the fourth dose. Three others stopped treatment on account of pain at the site of injections and without reason. These last four are not shown in the Table. In view of the results of Solganol treatment recently published by Dr. E. Muir,* it is of some interest to note that both the Tamil cases treated showed no improvement.

Conclusions.

1.—With the precaution of a desensitising dose in cases known to " react " readily, Solganol treatment was not found to be dangerous.

2.—So far as the eye condition is concerned, the results shown in the Table may be summarised thus: improved six, no change four, worse one.

3.—It is possible that the results are better in patients of Chinese race than in those by Indian race.

4.—The cases having been carefully chosen, there were no " reactions " or deaths as a result of treatment. This compares favourably with the results published as quoted above.

I have to thank Dr. A. G. Badenoch, Medical Superintendent, Sungei Buloh Settlements, for permission to use these cases and Dr. R. D. Fitzgerald, Acting Adviser, Medical and Health Services, Malay States, for permission to publish this report.

*Muir, E., *Leprosy in India.*" Vol. IV, No. 1, January, 1932, p. 7. It should be noted that this publication was received when the above experiment was almost completed.

TABLE SHOWING RESULTS OF TREATMENT.

Serial No.	Names of cases.	Sex and Age.	Type CN	No of injections and period of treatment in months.	Dosage range in grammes.	Total Dosage in grammes.	Original condition.	Results and Remarks.
1	Leong Kun	M C 37	C2 N1	15–3	0·01-0·5	2·705	Chronic conjunctivitis with much pain.	Vision better. Conjunctivitis improved; generally slightly worse.
2	Chong Man	M C 59	C1 N3	15–3½	0·01-0·5	2·705	Paralysis right side of face. Corneal opacity, ectropion, iritis and scleritis.	No improvement. Symptoms just the same.
3	Muthusamy	M T 35	C1 N3	15–3	0·01-0·5	2·705	Chronic conjunctivitis with photophobia, pterygium and irido-cyclitis on left side. Slight ectropion on right side.	No improvement. Now has general pain.
4	Ng Heng	M C 38	C1 N2	15–3	0·01-0·5	2·705	Chronic cunjuctivitis with ectropion left side.	Vision now better. Less lachrymation.
5	Liew Wan	M C 67	C1 N1	11–3	0·01-0·25	0·995	Ectropion left side. Corneal opacity, iritis and pterygium.	Interrupted treatment on account of severe conjunctivitis.
6	Seet Cheng Swi	M C 20	C3 N1	15–4	0·01-0·5	2·705	Much lachrymation from chronic conjunctivitis.	Disappearance of lachrymation. Slight improvement.
7	Pan Choi	M C 36	C2 N1	15–3	0·01-0·5	2·705	Ectropion both sides. Chronic conjunctivitis.	Just the same.
8	Kalinakam	M T 30	C1 N2	15–3½	0·01-0·5	2·705	Chronic conjunctivitis with blephritis.	No improvement. Lachrymation as bad as ever.
9	Cheong Choon	M C 40	C1 N2	15–3½	0·01-0·5	2·705	Chronic conjunctivitis particularly on left side. Marked irido-cyclitis with pterygium on left side.	Cessation of pain in eyes, but now has numbness of hands.
10	Yap Fah	M C 46	N2	15–3½	0·01-0·5	2·705	Chronic conjunctivitis with much pain. Ectropion on both sides. Photophobia and stenosis of the lachrymal ducts.	Slight improvement. Less lachrymation.
11	Aminah binti Mangoon	F. Jav. 30	C1 N2	15–3½	0·01-0·5	2·705	Chronic conjunctivitis with much lachrymation. Slight ectropion, left side. Much pain in both eyes.	Improvement. Disappearance of lachrymation. General condition better.

Itu Leprosy Colony, Nigeria.

J. A. MACDONALD.

Report for the Year April 1st, 1931—1932.

PRESENTED TO THE CALABAR PROVINCIAL COMMITTEE OF THE BRITISH EMPIRE LEPROSY ASSOCIATION.

THE number of patients treated during the year was 1,012. The provinces from which they came are tabulated as follows :—

Owerri	455
Calabar	322
Ogoja	179
Onitsha	41
Warri	6
Benin	5
Cameroons	2
Togoland	1
Sierra Leone	1
Total	1,012

During the year, 52 were discharged and there were 21 deaths. New admissions numbered 182, including 50 crippled and debilitated cases from the Port Harcourt Settlement; 60 not included in these figures went away for food ostensibly and did not return. A number were definitely improved and probably did not see any reason to return.

Treatment.

The treatment during this entire period has been with a mixture of hydnocarpus oil and its esters, which we make in our own laboratory. It is given by injection subdermally and intradermally twice weekly according to the individual charts of temperature. The results have been reasonably satisfactory. A rapid cure for leprosy has yet to be discovered. The 52 cases discharged were rendered symptom-free after being with us for three to four years. All traces of active disease had disappeared, pigmentation had returned to the skin partially, and sensation was complete except in some cases in the feet. The marks of leprosy are somewhat difficult to eradicate. The result is, however, a great advance on what was once a hopeless outlook for the sufferer. We have always 150 or so, in whom the chances of complete cure are remote, that is those who came first in a state too far advanced to be checked by any drug. They are fed, their ulcers dressed and their lives rendered more comfortable than they would be in their towns.

We take them in not because there is much hope of cure, but because they can be helped, and in any case many of them are driven from their towns or brought by their friends, skilfully deposited on our beach or road and abandoned helpless and quite unable to return.

As for the remainder, *i.e.*, the majority who are in the intermediate stage, some get steadily worse in spite of treatment, but there is no doubt that the great majority are distinctly improved. The lesions cease to increase and become less erythematous, the pigment returns to some extent to the skin, and the ulcers heal. They are stronger, feel more and feel better. We have proved that the drug has certainly a deterrent effect, as those who go home and for one reason or another stay at home for prolonged periods, in them the disease frequently breaks out in all its active forms, and the condition is so much worse. The treatment is painfully slow, but I estimate that of those present just now, if there is patience on both sides some 40, or 50 per cent. will go out symptom-free.

It is a matter of deep regret that so few cases come in the really early stages.

As for the external application we use 1 in 15 carbolic acid, or Ung. Hydrarg. Iod. Rub., 1 in 2 with vaseline, which have the effect of removing the outer epidermis, and when it is healed the patch is considerably darker. We use Avenyl in oil for patients suffering from syphilis before putting them on to the ordinary injection, while intestinal worms, hook-worm disease, etc., receive due attention. A few major operations and a great many minor ones amounting to several hundred were performed during the year

Untainted Babies.

There were eleven in the hostel nursed by clean nurses. One was taken home to be cared for by friends. So far, none of these, or those cared for in previous years, so far as we have heard, have taken the disease.

Industries.

The past year has been one of great activity, especially since last October when Mr. Paterson, Master of Works, came out. While the value of the work done cannot be stated in terms of hard cash, the fact that all the work of the colony with the exception of four men and three nurses in the Babies' House—that is for close on 1,000 people—is done by the patients themselves is a point worthy of attention. Every one does his share of the work, and the patients are kept occupied mentally or physically from morning to night. There is the work of nursing, police, sanitation, transport,

temperature-taking, occupying 30 clerks, carpentry, blacksmith-work, soap-making, cement blocks, native house-building and repairing. The erection of a hospital for women gave employment to many, while agriculture absorbs the greater portion of the labour for six months of the year. All patients, men, women and children get work which is organised under Headmen according to their strength and ability. There are always 100 or more, who for one reason or another are unable to do anything, while children and another 100 adults are only fit for lighter duties.

Much time and labour has been spent clearing more bush for future planting and although the farm is not what one may call a remunerative concern, it is without doubt the most profitable way of using the labour we are forced to employ. The farm products of last year are being used to feed the poor, and a further and larger area will require to be cultivated this year to provide for the steadily growing number on the poor list. Some 30,000 to 35,000 yams were planted and two or three tons of coco-yams along with vegetables, also 20 acres of cassava. A garry*-making industry has been developed at a cost very little under market value. This " very little under " does not by any means cover the cost of planting, but yet we are prepared to use the word profit rather than loss, for thereby we have been able to use the labours of the work-list, and so keep lower the number on the poor-list.

The extraordinarily low prices prevailing in the native market are against us showing a more profitable report. Last year at this time the price of garry was 5s. to 7s. a bag, while to-day it is purchased for 2s. We have also to-day 30 men and women employed in palm-products. These supply oil for soap, oil for the poor, and oil and kernels for sale. This shows a considerable rise in the amount of oil procurable from the same area. Two years ago there was scarcely enough oil to supply the needs of the colony, and now, during the last three months, we have been able to sell two puncheons,† and nearly a ton of kernels. This remarkable increase is due to the clearing of the bush, tillage of the soil and the weeding out of unprofitable palms and parasites. The money received from the sale of palm products has just more than paid for the labour employed. Again, the present prices obtainable are against us showing a profit, but this also may be considered a saving. It is our intention to cultivate a large area with selected palms ; 1,200 seedlings have been supplied to us by the Agriculture Department.

* Garry is a flour made from Indian corn.
† A puncheon is a local measure (volume).

An attempt is being made to establish a milking strain of goats and thereby supply fresh milk at a reduced cost to the weak and the babies. It is too early to report on this scheme beyond mentioning that we have imported from England a valuable animal for stud purposes. We also hope to produce goats' flesh at a price less than that of stockfish, which is a considerable item on the food-bill. Joint efforts are continually being made to cut costs, to improve conditions and to utilise labour to the best advantage, to economise where economy will not hinder progress.

Educational, Social and Religious Work.

The expenses of this work are entirely defrayed by private contributions principally by private friends at home. We have six schools in the colony and three school buildings.

1. Children's Ibo school, 8 to 11 a.m.
2. Children's Efik school, 8 to 11 a.m.
3. Men's Ibo school, 8 to 10 p.m., three nights weekly.
4. Women's Ibo school, 4 to 6 p.m., three nights weekly.
5. Adult Efik school, 4 to 6 p.m., three nights weekly.
6. Adult school for the teaching of English, 4 to 6 p.m., two nights weekly.

The children are taught the usual school subjects, while the object of running adult schools is principally to enable them to read the Bible in their own language.

The Scouts, the Girl Guides, and the Brass Band, all help to brighten the life of the colony, and frequently provide concerts, and entertainments of various kinds. The gift of a cinema during the year was much appreciated, and the first display will remain memorable in the minds of the audience, African and European alike.

Some 1,000 garments, gifts from Ladies' Work-parties in the Church at home were distributed during this period. A new Church with a seating capacity of 800 was opened in August, a native building entirely with a floor which rises to the back, mud-seats, mud-pulpit and font. The band leads the singing, and the services in the Church are certainly an important feature of the colony life.

The ideal aimed at is to preserve as much as possible of the ordinary native life, except in so far as that which interferes with good government, and health, and comfort. There is a native court for deciding petty disputes, a market assembling daily from 5 to 6 p.m., for selling goods or produce made or grown in their own private plots, and the colony continues to be a happy place in spite of discipline and restrictions.

Has Leprosy Tendency to Spontaneous Arrest Without Defect?

P. H. J. LAMPE.

(*Reprinted from "Het Geneeskundig Tijdschrift voor Nederlandsch Indie," afl.* 15 *Deel* 72, 1932, *pp.* 946–952).

INTRODUCTION.

SURINAM is favourably situated for the study of the epidemiology of leprosy and related problems. The limited population (150,000) of the inhabited area is under good medical supervision and a fairly successful registration of the population in town and districts permits many investigations of a medico-statistical nature, which up to now were quite impossible in tropical countries with endemic leprosy.

The most reliable and most complete figures which can be gathered from the native population (negroes and coloured people) shows that not less than 60 per cent. of that population of 60,000 souls live in the capital, Paramaribo. Other advantages are that on account of the fact that there is little or no emigration or immigration, the differentiation of sex and age-groups of the native population vary little from year to year and on account of this imperceptible growth, this remains almost stationary.

TABLE I.

THE NUMBER OF KNOWN CASES OF LEPROSY, DIFFERENTIATED IN RACES AND AGE-GROUPS.

Age-Groups.	*Negroes and Coloured People.*	*British Indians.*	*Netherland East Indians.*	*Others.*	*Total.*
0—4 ..	15	—	—	—	15
5—9 ..	108	10	5	—	123
10—14 ..	160	11	3	—	174
15—19 ..	158	13	1	1	173
20—29 ..	177	21	1	2	201
30—39 ..	112	30	2	—	144
40—49 ..	76	49	7	1	133
50—64 ..	45	46	2	2	95
65— ..	13	5	—	2	20
Unknown	12	18	2	2	34
Total ..	876	203	23	10	1,112

The result of an anti-leprosy campaign inaugurated in 1927 has been that, without exaggeration, it can be said that the estimated number of known cases of leprosy is very nearly the same as the number of those known to be suffering from clinical leprosy.

Surinam is one of the few countries with endemic leprosy in high degree, where the differentiation of cases in age-groups can be studied. It is also one of the few countries where a remarkable peculiarity of that differentiation is seen; this, in my opinion, is important enough to warrant attention.

TABLE II.

THE NUMBER OF SUFFERERS FROM "CLINICAL" LEPROSY OF THE NATIVE POPULATION OF SURINAM PER 1,000 OF EACH AGE-GROUP: (MORBIDITY-INDICES.)

Age-Groups.	*Morbidity-Indices.*
0—4	1·9
5—9	16·6
10—14	24·6
15—19	25·9
20—29	19·2
30—39	13·2
40—49	11·7
50—64	7·9
65—	4·6
Average	14·7

TABLE III.

RATIO OF MORBIDITY-INDICES (TABLE II); LARGEST INDEX = 100.

Age-Groups.	*Morbidity-Indices (comparing-figures).*	*Morbidity-Decrease.*
		Per cent.
0—4	7	
5—9	64	
10—14	95	
15—19	100	
20—29	74	26
30—39	51	31
40—49	45	12
50—64	31	13
65—	18	42

CONSIDERATIONS.

It is important to note the relations of the morbidity-rates, stated in Tables II and III, namely *the increase of the*

morbidity in proportion to the age until the age of 15 to 19 years is reached, and *the decrease of the morbidity* in proportion after the age of 20 years.

It is shown in the above that up to 20 years the chances of contracting leprosy are increased.

The decrease of that chance after the age of 20 years is reached, is difficult to understand, as the contrary should be expected or, at least, a less marked decrease, as leprosy is generally believed to be a disease which can develop at any age and is a chronic disease with little mortality.

In theory, the following factors can be considered as responsible for the rapid decrease of morbidity after twenty.

(*a*) The diagnosis is wrong in many cases of the younger age-groups.

(*b*) The large number of young cases of leprosy is a recent appearance.

(*c*) The knowledge about cases older than 20 years of age is less complete.

(*d*) The mortality of cases of leprosy is very large.

(*e*) Many young cases cannot be recognised as such later in life.

(a) Almost all diagnoses are stated or controlled by an official leprosy board of five medical men with much experience in leprosy, both clinical and bacteriological. That the decrease of the morbidity should be the result wholly or partly, of a large number of wrong diagnoses in the younger age-groups is hardly likely.

(b) Though I am inclined to believe that in Surinam the first visible symptoms of leprosy as a rule develop during youth, so that in my opinion an increase of leprosy will manifest itself firstly in an increase of the morbidity of the younger age-groups, yet I hesitate to consider that possibility as the cause of the high morbidity in these age-groups. Leprosy in Surinam is principally a disease of the native population and for that reason a town disease. On the one hand, the native population of the town is increasing without proportional extension of the dwelling space; on the other hand, better ideas about hygiene in general and about the prevention of leprosy in particular arise, whereas, the economic conditions of those classes of the population where leprosy prevails, have not changed to any remarkable degree.

For the above reasons I cannot believe that the relative high morbidity in the younger age-groups is due to an increase of leprosy, which increase would manifest itself

later on in a proportional increase of the morbidity indices of all other age-groups. If this occurred, the incidence of leprosy in Surinam would be almost doubled.

(c) As mentioned in the introduction, the number of known cases of leprosy (natives) is not far behind the real number of clinical cases and, therefore, allows careful conclusions in regard to certain statistical calculations. Nevertheless, it is not impossible that the knowledge about the occurrence of leprosy among school children and young adults who, in their school period, were under regular medical supervision, is more complete than that of the older age-groups, who, in their school period were not regularly examined for leprosy, unless *the early symptoms of leprosy, which as a rule develop in youth on parts of the body covered by clothing remain the same without arousing any serious suspicion among the sufferers or their close relations.*

(d) The figures which are at my disposal suggest that in Surinam, the mortality rate of sufferers from leprosy is an important point, and is greater than the rate of those not afflicted within the age-group of 15 to 19 years, but not to such a degree that the rapid decrease of morbidity after this age can be attributed to the larger number of cases dying before the age of 30 is reached.

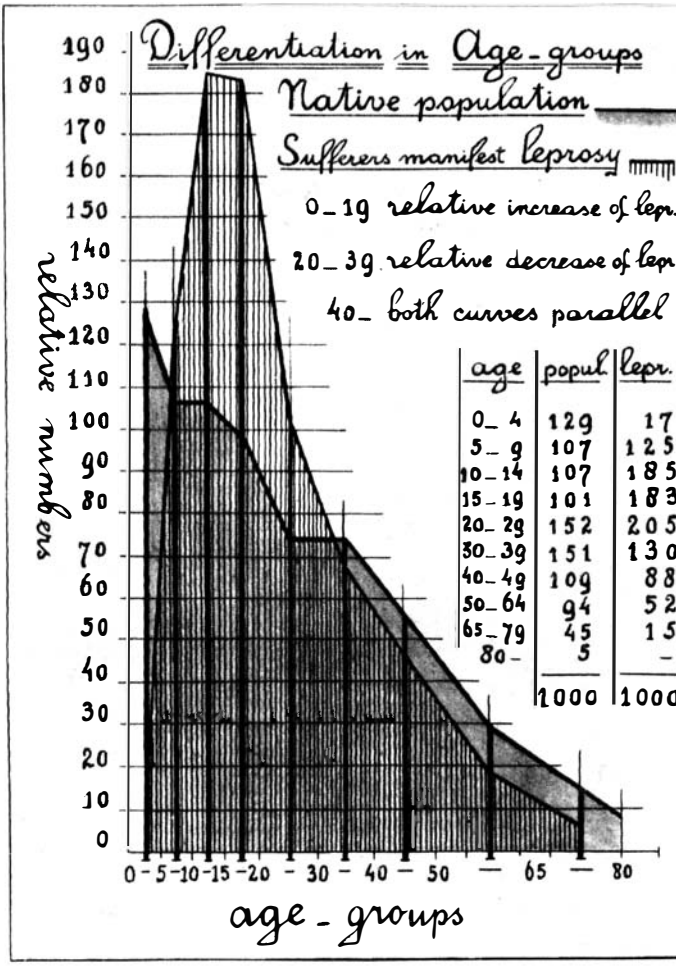
N.B.—The highest morbidity of advanced cutaneous types of leprosy is found in Surinam among men from 15 to 19 years and women from 20 to 29 years.

That the higher mortality of leprosy is not the main reason, neither a reason of any importance for the decrease of morbidity, is proved by the fact that the same decrease of morbidity is found in the neural types of leprosy without the possibility of tracing the lost cases as changed in cutaneous cases.

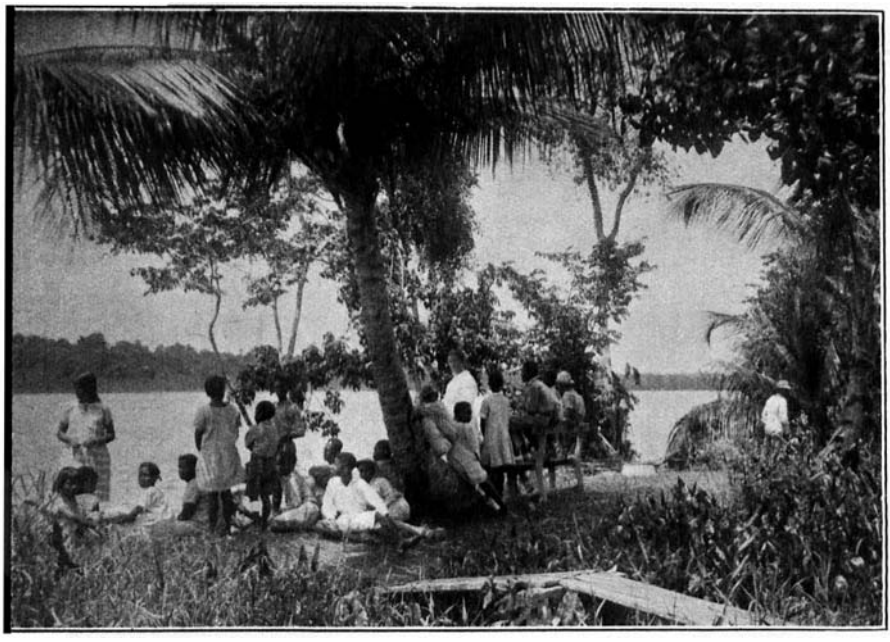
(e) The only remaining factor which theoretically can be considered as responsible for the large decrease of the morbidity is that a number of young cases cannot be recognised as suffering from leprosy when they are older, and do not consider themselves as cases of leprosy.

CONCLUSION.

The above considerations lead to the hypothesis that in many cases the early symptoms of leprosy in children and young adults remain the same or diminish ; in other words, only some of the externally visible lesions of leprosy develop into the more advanced stages which, in countries with endemic leprosy, are recognised by laymen. It is in that sense that the title of this paper is to be read.



age	popul	lepr.
0- 4	129	17
5- 9	107	125
10-14	107	185
15-19	101	183
20-29	152	205
30-39	151	130
40-49	109	88
50-64	94	52
65-79	45	15
80-	5	-
	1000	1000



II Leprosy Asylum "Bethesda."
A Corner of the Playground.

IV. Dispensary School.
Playground of the School.

Probably the same hypothesis applies to early symptoms which develop at a later age, but the figures to hand cannot give conclusions about that.

N.B.—It is not only improbable, but rather impossible, that those frequent arrests without defects are the results of (specific) therapeutic measures, as the application of same in Surinam on a large scale is of too recent date.

The conclusion discussed above is confirmed by my own clinical observations. Spontaneous arrest of visible symptoms indicating active leprosy infection—already described by Hansen—is known to all clinicians (Reference Nos. 3, 8, 12 and others).

Spontaneous arrest of " early " symptoms is also observed by others and by some authors its frequent occurrence is emphasised (Reference Nos. 1, 4, 5, 6, 7, 11).

Further, there are observers who, doubting the therapeutic value of the so-called specific medical treatment, impute the good results of the modern leprosy treatment to the tendency of leprosy to regress spontaneously (Reference No. 14).

Finally, reference can be made, be it with some hesitation, to a few epidemiological facts, which are better understood if " subliminal infections " or " abortive cases " are frequently met with, and antibodies are formed (Reference Nos. 1 to 5, 7, 12 and others).

For example :—

(*a*) The often mysterious insusceptibility of persons in infected surroundings, who so far as is known have to be considered as susceptible.

(*b*) The less frequent occurrence of conjugal leprosy (in countries with endemic leprosy).

(*c*) The proportionally more frequent occurrence of early leprosy at an older age among people who have spent their youth in leprosy-free countries (personal impressions).

(*d*) The fact that in some cases their infection cannot be traced in spite of every investigation.

Finally, in the above suggestion the frequent occurrence of the " abortive." type of leprosy is further illustrated by epidemological observations in connection with the other chronic infectious diseases, viz., the tuberculosis (Reference No. 13 and others).

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Grants for Leprosy Work.

The Executive Committee of the British Empire Leprosy Relief Association have recently made the following grants :—

BRITISH GUIANA. The Surgeon-General, Georgetown, for schemes for proper housing and treatment of children **£300**

UGANDA. For distribution by Local Committee ... **£500**

BRITISH SOLOMON ISLANDS. Methodist Mission, Bilua (Dr. Sayers), for buildings for a new leprosy settlement **£100**

Applications for financial aid will be sympathetically considered by the Committee, and all applications should, in the first place, be sent to the Director of Medical Services of the colony concerned, who will forward them to the Secretary of the Association.

Correspondence.

SUNGEI BULOH,
FEDERATED MALAY STATES.
June 6th, 1932.

DEAR DR. COCHRANE,

I think that possibly some notes on my visit to India may be of interest to your readers. I found my three months in that country intensely interesting. It is difficult though, to have any coherent idea about things in India.

I saw Dichpali first. The medical administration there is very good, and I got a lot of ideas. One thing I would criticise is the system of giving patients their rice and a little money daily to buy the proteins, vegetables and fats. I am sure the average patient is quite unfit to regulate his own diet. Badenoch is finding here in Sungei Buloh that the prognosis in the acuter phases of leprosy is very closely inter-related with the calcium metabolism as judged by blood estimations and I feel that it is not right to leave these things to the patient himself.

The Leprosy Section of the Tropical School seems to me to divide itself into four—the out-patient work, the Gobra Hospital work, experimental work, and the " Propaganda Treatment and Survey."

The out-patient work is, of course, completely new to me, coming from a land of segregation. They are certainly getting much earlier cases than we do (on the other hand Lowe in Dichpali is getting just as early cases into hospital). For experimental purposes and for the study of early phases this out-patient system is wonderful. The idea is, I take it, that if you free a case of leprosy from the fear of segregation he will come voluntarily for treatment at an early stage. But is it not really the fear of his fellow-men, the dread of leprosy itself, the age-long terror that comes out of the hinterland of his mind and what Stevenson calls the " physical disgrace " ? Mere segregation is a flea bite compared with that. I don't believe we will ever get the average case to come voluntarily and regularly into the open, whether there is a risk of detention or not. Not unless you get a new world—therapeutic and social.

So much for the idea. In actual practice an early case comes along to the institute in the early morning. What his home is like, nobody knows. Has he given up a day's work to come ? Has it cost him something in train fares ? Will he get sacked if anyone knows ? Can he get decent food ? Is he worrying his head off ? Again nobody knows.

He waits in the big waiting room there for an hour or two among a crowd of strange people in this huge foreign room, then the Indian doctors come along. He is brought in, flicked with pieces of cotton wool, blood taken out of his arm and generally given a series of bewildering orders. He is told to hand over eight annas as a medicine deposit and given a card, told to take exercises and come back next week for injections. I know its all right and necessary, but it could do with a wee bit more of the human touch. Then of these out-patients let us suppose that 50 per cent. of them are not frightened off by the first visit to a huge and strange institute. Of those that are left say 50 per cent. again are in economic circumstances good enough to spare a day off once a week and get a sufficient diet. Will half of these again have the intelligence and force of character to take regular exercises, attend the clinic with regularity, change anything faulty in their way of life ? How many of the remainder have diseases which cannot be diagnosed in an out-patient clinic but which aggravate the leprosy ? And this hypothetical Gideons band that remain—men of good health, of force of character, of decent economic circumstances—this little group of the righteous who need no physician—might they not get better with no treatment at all ? I admit all this is one-sided and exaggerated. Please don't think I do not appreciate the job that's being done. I am just putting forward one aspect that struck me.

Gobra Hospital is, of course, linked up very closely with the clinical experimental work of the institute. The organisation is really amazingly good although it is only possible in a small institution. They do not use Tai Foong Chee or alepol. I am convinced however that the chronic induated type of advanced and resistant leprosy is helped by Tai Foong Chee and that cases which can stand large doses of alepol will often do well. Later on I may have figures to show about that. They are experimenting just now with mercurochrome which is really the best drug I have seen for the febrile cutaneous type of reaction. Better than P.A.T., or anything else. I have had as good results in one or two cases with P.A.T. and also para thormone, but in the average case mercurochrome seems the best thing we have got so far. I am working here at the moment on the effects of the halogen compounds and of the coal tar dyes and am getting some very interesting results. I don't want to anticipate my own findings but I will mention that Fluorescin for instance, in intravenous doses of 5-10 c.c. of a 2 per cent. solution in Sod. Bic. not only seems

to stop reaction but produces rapid (within a month) disappearance of thickened and "tuberculoid" lesions. Mercurochrome does not affect nerve reaction—and I am not sure about the effect of the dyes yet. The other thing we are doing here is the intramuscular injection of the Tamil Vipernery oil for nerve pains. The effect is better than anything we have previously tried. We got the samples from Fiji and are now making our own.

However to return to Calcutta and leave this digression, Muir is conducting a lot of experiments with different drugs injected intradermally and making sections before and after. It is interesting and I think an essential piece of work, but I feel that it presupposes that leprosy is primarily a disease or sensitisation of the skin. If leprosy is not primarily a local skin disease, then the experiment is bound to fail. It would be just as effective to do intradermal injections on a tertiary syphilide or a typhoid rash.

On village work, I met Dr. Santra—a most agreeable and stimulating man. (The condition of things in some of these Indian villages by the way is really appalling). I met Sharpe in Purulia and spent four or five days there. The atmosphere there is very good. They have got the same system of giving out rice and letting the patients buy the rest there—I do feel that is fundamentally wrong.

Somehow in all the places I saw, I missed the freshness and the smiling faces and the buoyant outlook of Sungei Buloh. Perhaps it's India—perhaps it's because I did not know the language and the people.

This letter sounds a long series of criticisms—I have really just put down the critical side. India these days seems such a chaos compared with our ordered little country. Sufferers from leprosy begging in the streets, the hopeless degradation of the villages, starvation, congress activities, the tremendous odds against which good work is being done and the dusty, hot weariness of it all. I admit the sunset in India is wonderful—one can see old temples in it and centuries of history—our sunrise is merely an abandon of fresh, clean colouring, but I was glad to see it again.

With kind regards,

Yours very sincerely,

GORDON A. RYRIE.

INDIAN SECTION.

A Note on Leprosy and Sex.

(*Reprinted from "Leprosy in India," October*, 1932.)

JOHN LOWE.

FROM conversations with leprosy workers in India we have found that there is a common idea among them that leprosy is more common among females up to the age of 30 and after that age it is more common among men.

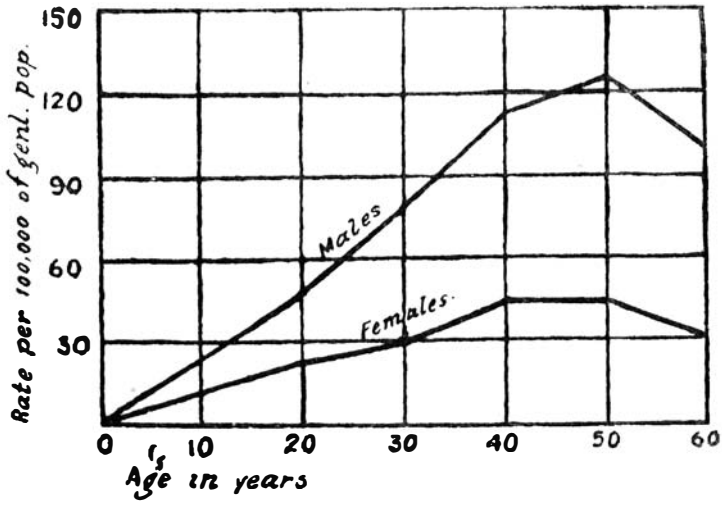
This idea seems to be based on the data concerning sex incidence given in Rogers and Muir's "Leprosy," pages 215 and 216. These data are based on the figures given in the 1921 Census Report for India. A careful reading of these two pages shows that the figures quoted give no evidence that leprosy is commoner among females up to the age of 30. It must be admitted however that this particular section of Rogers and Muir's book is in many ways misleading and that it badly needs editing if not rewriting. One thing which is very misleading is the heading to Table XVIII, p. 216 which reads as follows "Sex incidence of leprosy at various age periods per 10,000 of each sex."

Ages.	*Males.*	*Females.*	*Ages.*	*Males.*	*Females.*
0– 5	45	92	35–40	1,192	977
5–10	103	200	40–45	1,505	1,288
10–15	256	433	45–50	1,013	794
15–20	416	646	50–55	1,167	1,028
20–25	591	779	55–60	497	443
25–30	892	939	60 & over	1,156	1,123
30–35	1,193	1,170			

We have studied the 1921 Census Report, and traced the figures on which this table is based. The heading of this table on the Census Report is "Distribution of the infirm (lepers) by age per 10,000 of each sex." This again is a little ambiguous. What it really means is "Distribution of leprosy by age, per 10,000 lepers of each sex" *i.e.*, ten thousand male lepers at the time of the census are distributed in the various age periods as shown in the table, and similarly with 10,000 female lepers. The table now becomes understandable. It tells us nothing about the relative incidence of leprosy in the two sexes, but it does tell us that at the time of the census a larger proportion of the total number of

female lepers were below 30 years of age, and a smaller proportion above 30 years of age, than was the case with male lepers. There are several possible explanations of this. It may be that the death rate among female lepers is higher than among males. This is Rogers and Muir's explanation, but it is not supported by the above table; for the proportion of lepers of each sex aged 60 and over is about the same. A second possible explanation is that in females the disease may appear at an earlier age than in males, or another possibility is that susceptibility to leprosy in childhood is roughly equal in the two sexes but that in adult life males are more susceptible than females. All these ideas are very hypothetical and are based on figures of very doubtful reliability so we will not discuss this matter any further. We might however, discuss briefly the matter of relative sex incidence. The 1921 Census Report gives the following figures for all India 74,293 males 28,220 females, total 102,513.

The age distribution of these for each sex is shown in the graph here reproduced.



Thus the incidence of leprosy among males appears to exceed the incidence among females at all age periods.

Other information on the subject can be obtained from :—

(*a*) Leprosy institution reports which usually show a proportion of about four males to one female.

(*b*) Out-Patient clinics which usually show a proportion of six or eight males to one female.

(*c*) Survey reports which usually show a proportion of several males to each female.

Are these figures reliable? Almost certainly not. The census officers are all males, the doctors running leprosy surveys, clinics, institutions, etc., are mostly male, and owing to the seclusion of Indian women it is very difficult for such workers to find out the truth about leprosy among females. Women find much greater difficulty than males in leaving their homes to attend hospital and clinics. The facts about the prevalence of leprosy among females must be ascertained by special methods. The relative incidence in childhood can be ascertained by systematic examination of school children of both sexes. One such investigation has been made in Travancore where of 2,000 boys of school age about 1 per cent. showed signs of leprosy, and of 2,000 girls of school age about 1 per cent. showed signs of leprosy. Regarding the relative incidence in the two sexes later in life it is difficult to get accurate information. Work on a voluntary basis will only reveal a small proportion of the women lepers. The leprosy clinics run by the staff of Women's Medical College, Vellore, report a very small proportion of female patients. Compulsory medical examination of coolie labour in industrial areas may provide some valuable data.

Dr. B. N. Ghosh has kindly provided me with the following figures based on a survey of an industrial area in which all coolie labour male and female was compulsorily examined.

Males examined	109,471
Cases of leprosy detected	993
Incidence in males	·9%
Females examined	21,977
Cases of leprosy detected ...	262
Incidence in female	1·2%

Here the incidence in females is higher than that in males.

In another industrial survey, the figures for which have been given to me by Dr. K. R. Chatterji, investigation of sex incidence gave different figures:

No. of men examined	86,789
No. of cases of leprosy detected ...	1,489
Incidence in males	1·7%
No. of women examined	86,081
No. of cases of leprosy detected ...	813
Incidence in females	·9%

Here the incidence in males in this industry was nearly twice the incidence among females.

An investigation of labour conditions in these two industries reveals certain factors which may explain these differences in sex incidence. In the first industry living conditions are very bad, the work is indoors and rather unhealthy, and the women, in addition to working all day, have to work in their overcrowded quarters in the mornings and evenings ; also some of the women have from time to time to bear the burden of pregnancy and childbirth. These bad conditions weigh very heavily on the women and they show a higher incidence of leprosy than the men.

In industry No. 2 with a low female incidence, conditions are very different. The work is light healthy outdoor work, the living quarters are good and conditions are in most respects excellent. The women work outside all day and work in the house in the early morning and evening. They are the real supporters of the family. The men do less work and after the age of 30 often do no work at all, but stay at home and look after the children while the mother works. The men become lazy and often dissolute and drunken, but the women remain hard working and healthy and suffer much less from diseases such as leprosy.

These facts indicate that in conditions under which coolie labourers sometimes live, leprosy may in some cases be even commoner among women than among men. If, as is commonly supposed, the number of male lepers in India exceeds the number of female lepers, the preponderence of male lepers is probably not due to a greater susceptibility to the disease but to a greater exposure to infection. The greater exposure of males to infection is seen on studying family life in villages. It is seen at all ages even in childhood when the susceptibility to leprosy is greatest. A female child is often unwanted and stays in the house where no one takes much notice of her. At an early age she is expected to work in the house and often becomes the family drudge. She probably does not go to school and moves out of the house but little. As puberty approaches, custom, tradition and modesty limit even further her activities and movements. After puberty, marriage quickly follows and then family ties and duties confine her more than ever to the home. Thus her contacts outside the house are very limited and unless there is leprosy in the house there is little chance of her contracting the infection.

With a male child it is very different. He is greatly prized and petted and all the neighbours (among whom there may be cases of leprosy) want to pick him up, nurse and fondle him. As he grows older he has very much more

freedom than do girls. He may go to school, and he is not expected to work at such an early age as are girls. He moves quite freely about the village, possibly visiting the houses of lepers, who will not hesitate to call him into their home and make a fuss of him. Later on he goes to work, may move to other parts in search of work, and on the whole, lives a life of greater freedom and wider contacts than do females. This greater freedom means greater exposure to infection, and the male leprosy rate is higher than the female leprosy rate. When the seclusion of women is broken down, as it is with women coolies a greater number of women develop leprosy, and, in fact, under bad conditions the rate among women may exceed that among men.

This seems a probability but before making final deductions from such figures as these we must try to exclude possible fallacies. One possibility is that women belonging to families in which there is leprosy and women suffering from leprosy in a slight form cannot get married, and in order to support themselves they migrate to industrial areas and take up coolie work. I am informed that this factor probably did not operate markedly in the two industries quoted.

Age Distribution.

The age distribution of leprosy in the two sexes in an industrial survey was as follows :—

Age	14—20	28—30	31—40	41—50	Over 50	Total
Males	13%	33%	40%	17%	7%	100
Females	11%	21%	40%	24%	4%	100

This shows that contrary to the 1921 census figures the proportion of female lepers below the age of 30 is lower than the proportion of male lepers.

We have arrived provisionally at the following conclusions.

1. In India male lepers preponderate over female lepers.
2. This preponderance is seen at all ages.
3. The difference in incidence of leprosy on the two sexes is not due to any greater immunity to leprosy possessed by females but to the less exposure to infection of females owing to the more secluded life they usually live in India.
4. When the seclusion is broken down and women live under the same conditions as men, the leprosy rate among women may rise as high as or even higher than that among men.

The conclusions are provisional. The whole question of leprosy and sex needs further investigation.

Hydnocarpus Oil and its Ethyl Esters. How to prevent trouble with Injections.

(*Reprinted from "Leprosy in India," October*, 1932.)

JOHN LOWE.

INTRODUCTION.

THE two preparations for injection in most common use in leprosy treatment are hydnocarpus oil and its ethyl esters. The advantages and disadvantages of these may be summarised as follows :—

1.—*Cost.* Oil is cheaper, esters dearer.

2.—*Ease of Injection.* This is of importance where large numbers of patients have to be treated in a limited time. Esters being more fluid are more easily injected especially by the intradermal method. Oil being much less fluid at ordinary temperatures is more difficult to inject, but if heated it can be given subcutaneously, intramuscularly or intradermally.

3.—*Rapidity of Absorption.* The esters being more fluid are more rapidly absorbed than the oil. With intradermal injections this is a doubtful advantage.

4.—*Local Reaction.* The oil if pure and fresh causes little local reaction. The esters if properly prepared and used cause little reaction, but otherwise local reactions may occur.

5.—*Therapeutic Effect.* It is a matter of opinion which of these two preparations is more beneficial. The writer's own experience of subcutaneous and intramuscular injection favoured the esters. Only the esters have been extensively used for intradermal injection, but Dr. Muir has pointed out that oil heated to 50° C. can be given by intradermal injection and that the comparatively slow absorption of the oil may be an advantage rather than a disadvantage, for the local effect may be of longer duration. The oil injected intradermally is beneficial but whether it is as good as the esters remains to be seen.

Painful Injection and their Prevention.

Leprosy treatment is a long slow job. Many patients fail to continue treatment long enough. One factor which causes this is pain and trouble with injections. It is therefore most important that we should reduce this pain to a minimum.

From time to time we have ourselves experienced the difficulty of producing oil and esters which are comparatively painless. We have from time to time received reports about the painfulness of commercial supplies of oil and esters. We have therefore investigated the matter carefully, and the results of our enquiries are incorporated in this brief paper.

In general the factors tending to give pain are :—

1.—Free fatty acids. These appeared to be of two kinds, first the free natural fatty acids found in perfectly good fresh oil and second fatty acids produced by oxidation in oil which is old and not carefully stored. The first appears to cause little irritation, fresh oils containing 6 per cent. of free acid sometimes giving little pain, but the oxidation products are much more irritating and if present in only small amounts may cause much pain on injection.

2.—Volatile impurities of doubtful nature produced by oxidation.

3.—Suspended impurities.

These irritating products can be prevented or removed by using only carefully stored fresh oil, by neutralising the acid present, by steaming to remove volatile impurities and by filtration. There are five requirements for comparatively painless injections of oil or esters. The oil must be pure and fresh, esters must be properly made, oil or esters must be properly sterilised ; they must be properly stored, and the injections must be properly given.

Fresh Pure Oil.—Oil must first of all be hydnocarpus oil unadulterated. Other oils or adulterated oils are often sold as pure hydnocarpus oil. Supplies should be purchased only from reliable firms. The freshest oil is obtained direct from the firms preparing it in the months of June and July. It may be advisable to purchase a year's supply in these months.

Oil can be tested by the polarimeter which will show if it is genuine hydnocarpus oil and will also detect adulteration, and it can also be tested for free acid and oxidation products. These tests are unnecessary if the oil is obtained from a reliable source.

Proper Storage.—Oil must be stored so as to prevent oxidation. Clean glass bottles with stoppers should be filled to exclude air and keep in a cool dark place. The same applies to storage of esters. Only remove from the store just sufficient for immediate requirements. Esters or oil

left over at the end of a day's work should not be poured back into stock bottles. For out-patient clinics it is usually better to have the oil or esters sterilised in four-ounce bottles, one bottle being emptied and used before the next bottle is opened. This prevents waste and facilitates the maintenance of sterility. Small amounts left over can be utilised for purposes other than injection.

The Proper Preparation of Esters.—The details of one satisfactory and simple method of making esters, a method which can be used even in small institutions is given in Appendix I. Methods of testing the purity of esters are given in Appendix II.

Sterilisation.—Oil and esters should be sterilised by heating to 120° C. for half an hour. This may be done in an oil bath or in an autoclave. Old hydnocarpus oil or any other cheap oil can be used for the oil bath. If it is done in an autoclave the bottles used must be good and be very securely stoppered. Otherwise the stopper may blow out and steam will get into esters, or the bottle may burst. Sterilisation should be done once only. Repeated sterilisation causes increase in irritating properties.

Before sterilisation creosote 4 per cent. may be added. Double distilled creosote of a reliable make should be used. Inferior creosote may contain impurities in large amount which may cause pain on injection.

The Technique of Injection.—This need not be described here. It is described fully elsewhere. We would emphasise one or two points which are sometimes overlooked. The needle and the syringe should be free from spirit or other disinfectant which may cause pain. By the intradermal technique only minute quantities (about 1 minim) should be injected at each puncture. Larger quantities may cause severe local reaction. Intramuscular injections are best not given just at the place on which the patient sits down.

If the precautions outlined in this note are carefully followed there should be little or no trouble with painful injections.

Any readers wishing for further information regarding sources of supplies, etc., may communicate with the Leprosy Department, School of Tropical Medicine and Hygiene, Calcutta.

I am indebted to Mr. N. K. De, the chemist of the Leprosy Research Department for information concerning the chemistry of the hydnocarpus preparations.

APPENDIX I.

The Manufacture of Ethel Esters of Hydnocarpus Oil.

1.—*Requirements.*

(*a*) Apparatus

3 Litre flasks.
Reflux condensers.
Measuring cylinders 500 c.c.
Hot water bath, *see* Fig.
Heating apparatus (electricity, gas or primus stove).
Retort stand with clamps.
Rubber tubing.
Separating funnels, 2,000 c.c.
Large funnel for filtration.
Filter papers large size.
Large double saucepan.
Burette (10 c.c.) and stand.
Erlenmeyer flasks 100 c.c.
Pipettes 5 and 10 c.c.

(*b*) Other supplies

Hydnocarpus oil.
Absolute alcohol.
Rectified spirit.
Sulphuric acid pure.
Caustic soda.
Creosote (double distilled).
Phenolphthalein indicator.
Common Salt crystals.
Normal solution of Caustic Soda.
Soda Ash (exsiccated Sodium Carbonate).

2.—*Methods.*

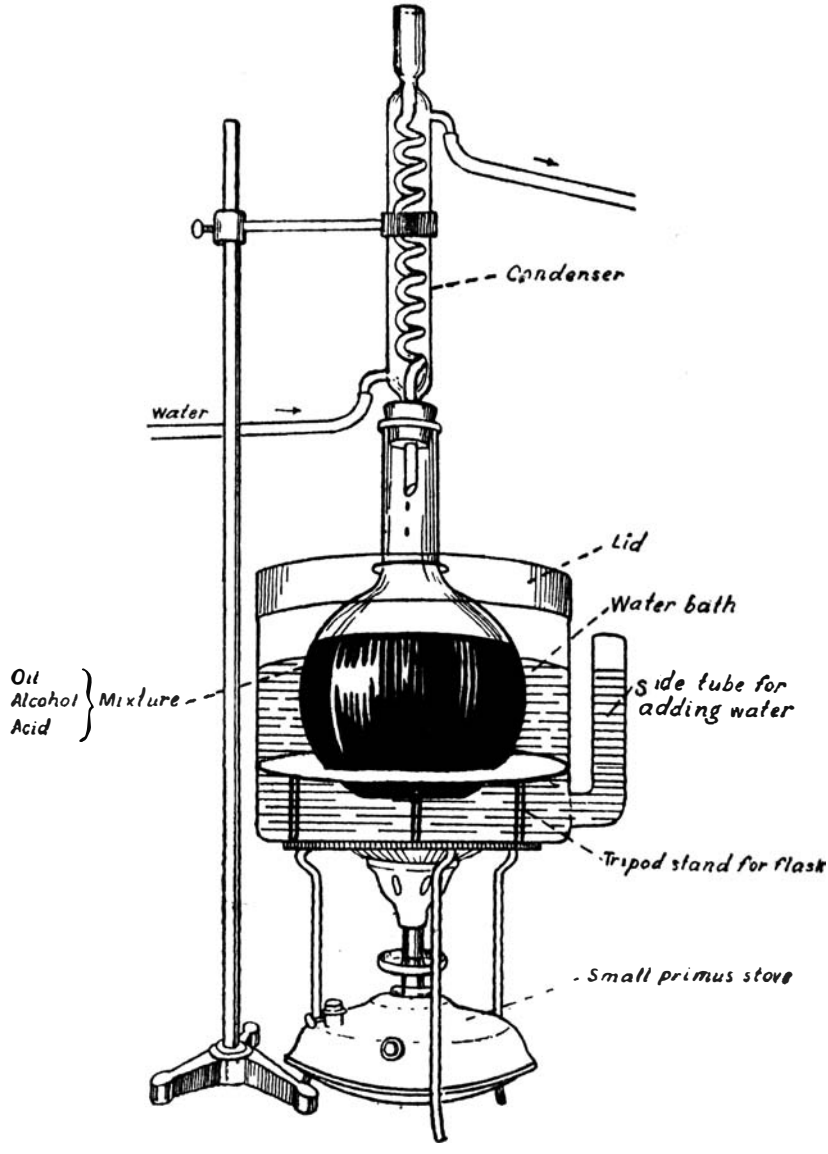
In a 3,000 c.c. flask pour alcohol 95 per cent. by volume (*see* note) 1,300 c.c., sulphuric acid pure (specific gravity 1·84), 75 c.c., and when these are thoroughly mixed add hydnocarpus oil 1,090 c.c. After the mixing the oil falls to the bottom of the flask. Heat on hot water bath with a reflux condenser attached to flask so that there is just a steady drip of condensed alcohol from the bottom of the condenser. The esters when formed are a light brown oily fluid which rises to the top of the fluid in the flask. On this apparatus the esters separate in about three to four hours. Having seen the time needed for separation to start, say four hours, allow an equal time, four hours, for completion. Allow to cool.

Testing for Complete Esterification.

If necessary this can be done by mixing 2 c.c. of the esters with 2 c.c. of 95 per cent. alcohol. If esterification is complete, complete solution occurs with a little shaking and without heat.

Washing Esters and Neutralising Free Acid.

Pour the esters into two separating funnels of 2,000 c.c. capacity. Run off lower layer leaving the esters. (About 70 per cent. of the fluid removed is absolute alcohol which can be recovered by distillation). Wash the esters three times with equal quantities of cold water. Then add an equal quantity of hot caustic soda 1 per cent. solution (dissolved in water and filtered). This forms a very thick emulsion. At once fill up the funnels with boiling water, add to each funnel about 4 drams of ordinary table salt, place the stopper in the funnel and without shaking rotate



APPARATUS FOR MANUFACTURING ETHYL ESTERS.

the funnel in the horizontal position to bring the salt into contact with the emulsion. Rotate for about one minute, then gently replace funnel in stand and leave till separation is fairly complete. This may take one or two hours. If separation is slow it can be accelerated by running out what water has separated at the bottom and refilling the funnel with boiling water. After complete separation the esters should be washed three times with boiling water. At the end of this process the esters are light brown and opaque because of a considerable amount of water remaining in emulsion.

Steaming.

The irritating volatile impurities can be largely removed by steaming, that is by passing steam through the esters for about two hours. This is best done between the washing and the drying as steaming introduces water into the esters. Steaming makes the esters lighter in colour and reduces the irritating smell of the esters. Steaming should be continued until the irritating smell has practicallydisappeared. The water introduced by steaming can be removed by a separating funnel.

Drying.

The esters are heated over boiling water. A double saucepan is very convenient. After about a quarter of an hour's heating the top pan containing the esters is removed and allowed to stand for a few minutes. Nearly all the water settles to the bottom and the esters at the top can be gently poured off and the water with a little esters at the bottom can be removed. The esters are again heated on the double saucepan, and the process of water removal can be repeated, if necessary. Within half-an-hour of the heating being started, the esters can be rendered perfectly free from water, the small amount of water left towards the end being driven off as steam. The esters finally should be clear and free from emulsion, though there may be fine particles in suspension.

Filtration.

The dried esters are now allowed to cool and they are then filtered. A large funnel and filter paper 1-ft. in diameter greatly accelerates filtration. With such apparatus from 8 to 10 lbs. of esters can be filtered through one funnel in an hour or two. The resulting esters are light brown in colour and perfectly clear.

3.—*Quantities.*

By the method here outlined from 1,090 c.c. of oil 1,150 c.c. of e ters are produced. 1,300 c.c. of alcohol

are used and 60 per cent. of this can be recovered redistillation (*see* next section).

4.—*Note on Alcohol.*

Strength. The alcohol for making esters should have a concentration of about 95 per cent. by volume of alcohol. Absolute alcohol purchased from a reliable source contains 99 per cent. by volume of alcohol. Rectified spirit (B.P. standard) contains 90 per cent. by volume of alcohol. The alcohol recovered by distillation after making esters contains about 93 per cent. of alcohol. It is therefore quite satisfactory to mix equal parts of (1) absolute alcohol, and (2) either rectified spirit or recovered alcohol. This gives a mixture containing about 95 per cent. of alcohol.

Method of Recovery of Alcohol.

When esterification is complete the esters rise to the top and the lower layer consists mainly of (1) alcohol (2) sulphuric acid (3) glycerol. This lower layer is removed with a separating funnel. The acid is then neutralised and the alcohol is distilled off. The method is as follows. To 1,000 c.c. of this alcohol mixture add 140 grammes of dry commercial washing soda (exsiccated sodium carbonate). Leave over night. Transfer the mass to a flask containing a few pieces of pumice stone. To this flask attach by glass and rubber tubing a condenser. Heat the flask on a water bath and distil the alcohol over. The same apparatus which is used for ester making can be modified by tubing to do distillation also. Sometimes a thick emulsion will form in the flask and distillation will be arrested. If this occurs add to the emulsion about 50 c.c. of water and distillation will then recommence. About 60 per cent. of the alcohol used, can be recovered by distillation. This recovered alcohol can be mixed with absolute alcohol for making more esters.

APPENDIX II.

Method of Testing Esters.

Esters should be yellow or light brown. They should be perfectly clear. They should have a characteristic odour which should not be too pungent. If a specimen passes these tests, it can be tested also by the following methods, dissolving in absolute alcohol, by testing for free acid, and by giving small experimental injections.

1.—*Test for Complete Esterification.*

If esterification is complete the resultant esters should be completely soluble in an equal amount of 95 per cent. alcohol without heat.

Partial solution indicates incomplete esterification.

2.—*Test for free acid.*

The suitability of esters for injection depends very largely on the amount of free acid they contain. The amount present can be estimated by titration, the esters being dissolved in absolute alcohol. Since absolute alcohol is itself usually acid in reaction, it has first to be neutralised.

Pour into a burette N/20 sodium hydroxide solution. Into a small conical flask pour about 10 c.c. of absolute alcohol and about 4 drops of phenol phthalein indicator. The alcohol being acid, no colour results. Run in the N/20 sodium hydroxide drop by drop until a faint pink colour is produced. This indicates that the alcohol is neutralised. Then add to the alcohol 5 c.c. of esters shaking to produce complete solution. The pink colour disappears. Read the level of the sodium hydroxide in the burette, then titrate drop by drop until the pink colour re-appears in the flask, shaking the flask all the time. Read the amount of sodium hydrate used. The amount of N/20 sodium hydrate necessary to neutralise 5 c.c. of esters should be less than ·5 c.c. and we find that such esters are satisfactory for injection. If on testing, the acidity is found to be too high, further washing and neutralisation of the esters by caustic soda is necessary. By the method here described we produce esters needing only ·2 c.c. of N/20 sodium hydroxide to neutralise 5 c.c.

3—*Test for Pain on Injection*, by giving small test injections by the intradermal method. Local reaction should be confined to slight induration lasting only a few days and there should be no ulceration.

Vocational Leprosy Distributors.

T. N. ROY.

THE question is still discussed in some quarters as to whether leprosy is always spread by contagion or not. The chief ground for doubt in this matter is the absence of evidence that the infected has ever come in contact with a case of leprosy. The six cases described are sufficient to demonstrate some of the ways in which members of the general public may become infected with leprosy without having any idea of any direct or indirect contact with cases of leprosy. Perhaps some of those who read this article will ask why I have not taken means to have these people deterred from carrying out their vocations which are such a danger to the public. The answer is that I have done my best to explain to these patients

their duty to the public. In some cases of employees we have notified the public health authorities and the sufferer has lost his employment. It is questionable however if the public taken as a whole is always benefited by such dismissal as the transmitter of infection is still at large and still a potential source of dissemination. Patients often allay the suspicions of their employers by giving out that they are suffering from syphilis. Very often a false address is given and, if efforts are made by the doctor to locate his dwelling, the patient will disappear and all hope of benefiting him and rendering him a non-infectious case is lost. In fact, short of an adequate and efficient staff of leprosy registrars, it would be difficult to control leprosy infection, and even with such a staff working, many of the most infectious cases would slip through their fingers ; for many of these cases are not conspicuous lepers, and in some cases their condition could not be recognised even by an expert apart from a bacteriological examination.

Case 1.—House servant. C3 case. Duration of disease 15 years. Was working in a boys' boarding school for about eight years. Subsequently he was taken on as a house servant by a gentleman. He must have been highly infectious during many of these years, but it was only when a lepra reaction came on that his master suspected that something was wrong and came to enquire what the disease was. On hearing he was infectious, his employer dismissed him.

Case 2.—Washerman. C2 case. Duration two years. Is still washing clothes and carrying them to where they are ironed.

Case 3.—Grocer. C2 case. Duration two years. He is still carrying on his trade and selling food to purchasers.

Case 4.—Durzie. C2 case. Duration two years. He sews dresses and supplies them to respectable firms in the City of Calcutta. He has a name as an expert at making ladies' and children's dresses. He is still at work.

Case 5.—Cook. C2 case. Duration five years. He is cook to a respectable Marwari gentleman and still prepares food for the family. He refuses to give his correct address.

Case 6.—Maid servant. C3 case. Maid servant in a doctor's house. She is probably still working but refuses to give her correct address. She is a highly infectious case.

These six cases are typical of many others known to me. The fact that I was able to secure their co-operation to the extent of getting them to come and be photographed shows that they are not by any means the most dangerous cases. The photographs of others could not be obtained ; they are even less amenable to reason and, therefore, all the more dangerous to the public.