LEPROSY REVIEW.

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Editor - R. G. Cochrane, M.D.

Contents.

DACE

Editorial											2
Studies o	n the Th	erapeu	tic Effi	cacy o	f Certa	in Dyes	s in Le	prosy	G. R.	Rao	4
The Mana	agement	of Rea	ction		••	••		Gordo	NA. F	V RIE	12
Curability	y and Re	elapse i	n Lepro	osy	••	••	:	Kensu	ке Міт	SUDA	15
Comment	s on Dr.	F. G.	Rose's	article	" The	Curabi	lity of	Lepros	у"	•••	19
Preservat	ion of Io	odised I	Hydnoc	arpus	Esters						23
Reprints- The J	– Bankura	Lepros	y Inves	tigatio	on Cent	re E.N	Muir ai	nd K. F	R. Снат	TERJI	24
The l	Distribu	tion of	Lepros	y in th	ie Suda	n	••	0. F	. H. A	TKEY	29
State	ement of States in	Progre 1933	ess mac	le in I	Leprosy	Work	in the	e Feder	ated M G. A. R	lalay YRIE	35
Reports			••	••		••			••		46
Correspon	dence		••		••				••		49
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The Association does not accept responsibility for views expressed by the writers. Communications may be sent to the Editor, at 131 Baker Street, London, W.1.

NOTES ON CONTRIBUTORS.

- G. R. RAO, L.M.S. (MADRAS), D.T.M. (CAL.), is Assistant Medical Officer at the Purulia Leprosy Colony, and until lately was the Special Leprosy Research Officer at Purulia for the Bihar Government.
- G. A. RYRIE, M.B., CH.B., is Medical Superintendent of the Leprosy Settlement at Sungei Buloh, Federated Malay States.
- KENSUKE MITSUDA, M.D., is a well-known Japanese leprologist and is Director of the Aiseien Leprosarium, Okayamaken, Nippon.
- E. MUIR, M.D., F.R.S.(EDIN.), is the Director of the Leprosy Research Department of the School of Tropical Medicine, Calcutta.
- K. R. CHATTERJI, M.B., is Specialist Leprosy Officer for Bengal.
- O. F. H. ATKEY, M.B., F.R.C.S., was until lately Director, Sudan Medical Services, Khartoum.

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Editorial.

N this issue of the REVIEW we are publishing further comments on Dr. Rose's article on "The Curability of Leprosy," printed in a previous number. The contribution which will arouse most interest is that by Dr. Mitsuda, entitled "Curability and Relapse in Leprosy." Dr. Mitsuda's figures show that nearly fifty per cent. of the cases which have recovered have relapsed after a period of 6–18 years. The general policy in Japanese institutions is one of not discharging inmates, and therefore these 128 cases on which Dr. Mitsuda reports could be easily followed up. Furthermore, while they are in the institutions, no matter whether they have become healed or not, treatment is continued. The question that will be asked is: Is there any reason for the varied reports which are being received from time to time concerning the efficacy of treatment? Dr. Mitsuda points out very clearly in his article, that it is of great importance to differentiate between the curability of neural cases and that of cutaneous ones. It is extremely difficult to assess the amount of credit which should be given to the specific chaulmoogra preparations in neural cases, because all are well aware of the general tendency of such cases to become naturally arrested with and without deformity. We cannot help feeling that if an independent observer were to visit and interpret the results of treatment in various countries, the discrepancies in the reports could be explained. The interpretation of the results depends on three factors: (a) The criteria of the individual reporting the cases; (b) the variety of case, and (c) the critical faculty of the individual. We do not wish to disparge the reports of any individual worker, but we do feel that there is some adequate explanation of these varied results, which would be forthcoming if a standardised type of record could be evolved, and if workers generally reviewed their results with as great an amount of criticism as possible.

We hope to refer further to the work in British Guiana in the next issue of the REVIEW. The reports of the Secretary's tours to various islands in the West Indies will be ready shortly, and a summary of these will also be available for the next issue.

The article contributed by Dr. Rao, on the therapeutic efficacy of certain dyes in leprosy, will be read with a great deal of interest, and it will be noted that his conclusions are that, so far, the results of treatment by aniline dyes do not encourage the belief that they have a future in the routine treatment of leprosy. The position with regard to these dyes is that they are still *sub judice*, and we would not advise any institution to try out these remedies unless they have proper facilities for experimental work. As has been abundantly proved, the appraising of the results of any particular remedy in leprosy requires the utmost care, and unless every factor can be taken into account, and the results viewed critically, conclusions may be drawn which later cannot be substantiated.

We welcome the article by Dr. Ryrie, on the management of reaction, for reaction in leprosy is one of the most difficult of all conditions which the physician has to treat.

Owing to the importance of the work generally at the Bankura Leprosy Investigation Centre, we have reprinted the article from Leprosy in India. The suggestion contained therein might very well be followed up by workers in other countries. It is manifestly impossible in a country where there are a large number of victims of leprosy to segregate or care for them all. Therefore, some other method will have to be devised if open cases are to be prevented from infecting others, and especially children. We are more than ever convinced that childhood infections are the most serious, and therefore the protection of children should be the main object in anti-leprosy measures. The importance of this is being realised by workers generally, and if propaganda could be encouraged which would result in the open cases segregating themselves along the lines which are indicated in Dr. Muir's article, an economical and effective method of segregation might then be evolved.

The article reprinted from the International Journal of Leprosy, by Dr. Atkey, is of interest, as it emphasises another important etiological factor, that is, the dietetic one. The Secretary, during his recent tour, was impressed by the fact that wherever leprosy was a problem of any endemic importance, the economic conditions of the people were poor. Especially was this seen in the matter of their diet. We would lay emphasis here on the great importance of field work, for we feel certain that the solution of the prevention of leprosy does not lie altogether along the line of therapeutics.

Studies on the Therapeutic Efficacy of Certain Dyes in Leprosy.

G. R. RAO.

INTRODUCTION.

T the suggestion of Dr. C. S. Ryles, of Dhanbad, in September, 1932, the present writer undertook to study the effect of brilliant green in leprosy, with special reference to the possibility of any renal damage that might be caused by the dye, while it is excreted through the kidneys. A C₃ case of leprosy with well marked cutaneous lesions, was selected, and was thoroughly examined for other co-existing disease, e.g., hook-worm, syphilis, malaria, etc., and after making sure that he was free from all other complicating affections, he was put on to brilliant green intravenously once a week. To begin with, a 1 in 5,000 solution of the dye in physiological saline, was used. Commencing with 10 c.c., the dose was gradually increased by 5 c.c. each week, until 50 c.c. was reached. Every week the urine was examined both immediately after the injection as well as on the next day of the injection. No trace of the dye could be detected in the urine and no evidence of any damage to the renal epithelium was observed.

With a view to reducing the bulk of the fluid injected and to increasing the concentration of the dye, a one in 3,000 solution was next used. After 50 c.c. was reached, without any apparent benefit, a 1 in 1.000 solution was used for some time. With the arrival of Dr. R. G. Cochrane (Medical Secretary, B.E.L.R.A.) in January, 1933, interest in this experiment was quickened, and it was thought desirable to use a stronger solution of the dye. Meanwhile Dr. R. G. Cochrane received an advance copy (in a private communication) of the "Preliminary Report on the Action of Certain Dyes in Leprosy," by Dr. G. A. Ryrie, which was subsequently published in the Transactions of the Royal Society of Tropical Medicine, Vol. 27, No. (1), June, 1933. And this advance copy the writer was privileged to go through, by the courtesy of Dr. R. G. Cochrane. This "Preliminary Report" served still further to stimulate our interest in the use of these dyes in leprosy, and we decided to make a thorough trial of brilliant green, trypan blue, and Bonney's blue. This experiment, initiated by Dr. R. G. Cochrane, has been continued by the writer up to date, and the results are reported on in this paper.

MATERIAL FOR STUDY.

Twenty inmates of this colony, mostly C_2 and C_3 cases, with well-marked lesions, were selected, and were carefully examined for the presence of any other co-existing disease or diseases which might adversely influence their response to the experimental treatment. Appropriate examinations were made for the presence of syphilis, malaria, hook-worm, or any other helminthic infection (the chief predisposing factors here) and when found, the necessary treatment was administered. After careful charting of their leprous lesions and bacteriological examinations of skin and nasal smears, they were subjected to the experimental treatment. BRILLIANT GREEN.

A one per cent. solution in physiological saline was used intravenously once a week. The required quantity of the solution was prepared freshly every week, just before use. Five cases (one C_3-N_2 case, two C_2-N_2 cases and two C_1-N_2 cases) were put on to this dye, and the treatment lasted for a period of from 9 months and 1 week to 10 months and 3 weeks. Their doses ranged from 5 c.c. to 12 c.c. More than 12 c.c. could not be given, as even smaller doses than that produced prolonged reactions. Only one case stood up to 12 c.c.; three could not take more than 10 c.c., and one could not tolerate more than 7 c.c. The usual precautions necessary for an intravenous injection of an unknown dye were taken and the injections were done under the personal supervision of the writer.

Results.

Of the five cases treated, two have improved to a certain extent, both clinically and bacteriologically; one is worse; and two are stationary. The case which has become worse, Girish Mahato, is the one who was originally treated with the very dilute solutions of the dye intravenously from September, 1932, to see if the dye had any adverse effect on the kidneys. So, he may be considered to have had the longest treatment with the dye (for nearly 1 year and 8 months) and yet he is worse after the treatment. Of the two cases who have improved to a certain extent, one, a boy, Hari Har Sarkar, with erythematous lesions all over, was probably in the reacting phase when he came in ; and the improvement can, at least in part, be reasonably attributed to the subsidence of the reaction; better living conditions (good food, hygienic lodgings, surroundings, medical attention, etc.) that ensued his admission into this institution, may explain the other part. This is the opinion of Dr. E. Muir also, who saw this case some time back. As for the other improved case, it is a debatable question whether she would not have improved without the brilliant green. Recognising the limitations incidental to the experiment, it seems permissible to conclude that brilliant green does not appear to be therapeutically more active than hydnocarpus derivatives or even equal to them.

Trypan Blue.

A four per cent. solution in physiological saline was used intradermally once a week, to begin with, and was found to be too irritating. It was replaced by a one per cent. solution which was used both intradermally as well as intravenously, on the advice of Dr. E. Muir, once a week. Six cases (three C_2 -N₂ cases and three C_3 -N₂ cases) were selected for this experiment, and their treatment lasted for a period of from 7 to 9 months. Their doses ranged from 1 c.c. to 12 c.c. More than 12 c.c. could not be given as even smaller doses produced fairly prolonged lepra reactions. One C₂-N₂ case, Chandra Das, could not stand more than 5 c.c., as he was getting reactions in his eyes, each time he was injected with the dye. Even 3 c.c. was observed to cause a prolonged reaction in his eyes, and this probably was a case of special idiosyncracy to the dye. Needless to say, he has not improved. It may be reiterated here that only a fresh solution of the dye, prepared just before use, every week, was used, as it was found that solutions more than a day old were too irritating. One case was able to stand 12 c.c. doses without reaction, but could not tolerate anything more than that. Another case could not take more than 10 c.c. The rest (three cases) were unable to stand more than 7 c.c. a week. Here also, individual idiosyncracy seems to play a part.

Results.—Of the six cases treated; only one has shown a very slight improvement clinically. All the rest are stationary. The relative focal concentration of the dye in leprous lesions, observed by Ryrie, was also noticed in all these patients; but no appreciable effect on the lesions, or on the M. leprae, could be obtained. The trypan blue used in these cases was obtained from Messrs. Smith Stanistreet and Co., Ltd., Calcutta, and it was a Grubler's product. So there is no question of want of potency or an unreliable brand having been used, to account for the very poor results obtained. And the results of this experiment are in marked contrast with the very favourable opinions expressed by Ryrie (*Ibid*). It may be argued that Ryrie used a 4 per cent. solution and was therefore able to obtain a greater concentration of the dye in the lesions, whereas I have used

a weaker solution (one per cent. only). But, as already mentioned before, I could not use a stronger solution. The 4 per cent. solution was found to be too irritant. And even the 1 per cent. solution has to be used carefully, commencing with small doses and increasing the dose very very gradually. Probably Ryrie's patients were comparatively stronger, and had a higher degree of general resistance and tolerance to the dye. Under the conditions of this experiment, the writer could not get any appreciable result with this dye, and he is led to conclude that any drug which produces frequent reactions, even in small doses, cannot be considered to be suitable for trial in cutaneous cases of leprosy of the fairly advanced types. It may also be observed here, in passing, that such startling results as are reported to have been obtained by Ryrie (Ibid), viz., bacteriologically positive cases becoming negative after a month's treatment, were not obtained by the writer, and such results may reasonably be explained by supposing that either those cases were very probably in the reacting phase when they were taken for the experiment, and with the subsidence of the reaction most of the bacilli disappeared from the skin lesions, or that the bacilli lost their acid fast characteristics, by the influence of the dye.

BONNEY'S BLUE.

This consists of a mixture of brilliant green and crystal violet in equal parts, dissolved in alcohol and water :—

Brilliant Green	 0.5 grms.
Crystal Violet	 0.5 grms.
Absolute Alcohol	 25 č.c.m.
Distilled Water to	 2500 c.c.m.

The crystal violet is first dissolved in alcohol, and is then added to the aqueous solution of brilliant green; and the total quantity is made up to 2,500 c.c.

A large quantity of this solution was very kindly made up and sent to us for trial, by Dr. C. S. Ryles himself, who was the first to use it in his out-patient clinics in Dhanbad. Nine suitable cases (six C₃-N₂ cases and three C₂-N₂ cases) were selected, and they were treated intramuscularly and intradermally with this preparation for a period of from $9\frac{1}{2}$ to $10\frac{1}{2}$ months. They were given as usual weekly injections of this preparation and their doses ranged from 1 to 12 c.c. One case only (a Santali, Mara Majhi) was able to stand up to 12 c.c. intradermally. More than 4 c.c. could not be given intradermally at one time, as it was found to be too painful. In some cases a good deal of local reaction ensued after the intradermal injection, but the resulting improvement was in no way commensurate with the reaction induced. When administered intramuscularly, too, the same irritation was noticed, resulting in localised hardness of the muscles at the site of injection, in spite of vigorous massage after the injection. One case in this batch of nine, was kept on to intramuscular injections only, as he could not stand the intradermal injections owing to his proneness to develop keloids at the site of the injection, even after taking $\frac{1}{2}$ c.c. or 1 c.c. intradermally.

Results.—All are stationary and not a single case has shown the slightest sign of improvement either clinically or bacteriologically. Intradermal injections of the iodised or creosoted esters of hydnocarpus, or of the heated oil, do show at least some appreciable clinical improvement and some slight but definite influence on the bacteriological findings in C₃ cases, in a period of 9 to 10 months, whereas Bonney's blue, used in the same way, does not appear to exert any appreciable influence either on the M. lepræ or on the lesions of leprosy, within the same period. Further particulars concerning these cases are given in the table appended.

DISCUSSION.

The results obtained by this experimental trial do not encourage one in the belief that these dyes have a future in the treatment of leprosy. The hopes induced by Ryrie's paper (Ibid) have not been fulfilled by this study. The writer is well aware of the criticisms that may be raised against this study—and to meet them, a short discussion here is deemed necessary, It may be laid down as a dictum that in carrying out any experiment with a view to ascertaining the therapeutic efficacy of a drug in such a chronic disease as leprosy, the fallacies connected with such an attempt, mentioned by Muir (1926), should be carefully borne in mind, and measures adopted to rule out such fallacies. Accordingly, in carrying out this study, the predisposing factors have been carefully studied and treated whenever possible, and cases found to be obviously in the reacting phase have not been selected for the experiment. To obviate the influence of the personal factor in carrying out this study only highly bacteriologically positive cases have been selected, with a view to having an unmistakable criterion of improvement, as it was felt that opinions based on purely clinical findings, such as the increase or decrease in extent of anæsthesia or slight changes in the colour of a hypopigmented patch, might be erroneous, as these changes

have been known to occur even without the use of any particular drug.

Comparative insufficiency of dosage might be advanced as a reasonable criticism against this experiment—and in reply to this the writer has to point out that the maximum limit of tolerance in each case was studied and the maximum tolerated dose was given. Comparatively speaking, Ryrie's patients have tolerated considerably higher doses, and it is also to be noted that most of his patients were Chinese, *i.e.*, lighter-skinned. Is it possible that lighter skinned races can tolerate higher doses of the dyes? This raises an interesting point for further study. In the case of mercurochrome, a fluorescein compound of mercury, the writer and his colleague, (Rao and Roy), have shown that Indians could not tolerate the doses recommended for Europeans. Is it not reasonable to suppose from the analogy with mercurochrome, that dark-skinned races probably cannot stand the aniline dyes in such high concentrations as the Chinese and other lighter-skinned races?

The period of treatment has been sufficiently long to enable one to judge whether the drug used has any appreciable influence on the course of the disease or not; and the longer period of treatment may help to make up for the comparative infrequency of the injections (Ryrie has given the injections twice or even thrice a week in a few cases). The bacteriological examinations and charting of cases have been carried out by the same observer, and no difference in the standards of accuracy of observation by two different persons can be held to account for the poor results obtained.

SUMMARY AND CONCLUSIONS.

(1) The results of an experimental study with brilliant green, trypan blue and Bonney's blue, in 20 cases of leprosy (inmates of the Purulia Leprosy Colony) are reported on.

(2) These dyes used in the doses mentioned in the text of this paper, were found to have no appreciable effect either on the course of the disease or on the causative organisms, the M. lepræ.

REFERENCE.

- (1) Ryrie, G. A. (1933). "Preliminary Report on the Action of Certain Dyes in Leprosy." Trans., Roy. Soc. Trop. Med., Vol. 27, No. 1. June (1933).
- (2) Muir, E. (1926). "Some Fallacies connected with the Testing of Drugs for their Efficacy in the Treatment of Leprosy." Ind. Jour. Medl. Res., 1926, July. Vol. 14, No. (1), pp. 125-128. (3) Rao & Roy (1932). "Mercurochrome—220 Soluble in Leprosy
- Work." Ind. Medl. Gaz., March, 1932.

LEPROSY REVIEW

C		Type	Preparation		1	
ser- ial	Name.	on admis-	used and Method	of	Dose	
No.	21011101	sion.	of Injection.	Treatment	Range	
1	Harish Kallyan	C ₁ -N ₂	Brilliant Green 1% sol. I.V.	mths. 8—10 ¹ / ₄	5 c.c. to 10 c.c.	
2	Hari Har Sircar	C ₂ -N ₂	do. I.V.	8—104	5 c.c. to 7 c.c.	
3	Girish Mahato	C ₁ -N ₂	do. I.V	. 84-104	5 c.c. to 10 c.c.	
4	Mothi Mahindi	C ₃ -N ₂	do. I.V	. 5 <u>1</u> — 91	5 c.c. to 12 c.c.	
5	Jhalu Mahatàn	C ₂ -N ₂	do. I.V	. 6 <u>1</u> —10 <u>1</u>	5 c.c. to 10 c.c.	
6	Kina Majhi	C ₂ -N ₂	Trypan Blue, 1 Sol. I.D.I. & I.	$\frac{\%}{V}$ 6 ¹ / ₂ —7 ³ / ₂	1 c.c. to 12 c.c.	
7	Madhu Sudon	C ₃ -N ₁	do.	5— 7	1 c.c. to 7 c.e.	
8	Dinu Mahato	C ₃ -N ₂	do.	5 <u>1</u> — 7 <u>1</u>	1 c.c. to 7 c.c.	
9	Chandra Dass	C ₂ -N ₂	do.	5 <u>3</u> 71	1 c.c. to 5 c.c.	
10	Kristo Mahato	C ₂ -N ₂	do.	6 <u>1</u> —6 <u>1</u>	1 c.c. to 10 c.c.	
11	Durga Charon	C ₂ -N ₂	do.	6— 9	1 c.c. to 7 c.c.	
12	Mara Majhi	C ₃ -N ₂	Bonney's Blue, I.D.I.	81-101	1 c.c. to 12 c.c.	
13	Arjun Mahato	C ₂ -N ₂	do. I.D.I.	7-101	1 c.c. to 4 c.e.	
14	Sombhu Mahato	C ₃ -N ₃	do. I.M.	81-101	2 c.c. to 5 c.e.	
15	Bharot Bartholmoy	C_2-N_2	do. I.D.I.	$7\frac{1}{2}$ - $10\frac{1}{2}$	1 c.c. to 4 c.c.	
16	Khetu Sorder	C_2-N_1	do. I.D.I.	$6\frac{1}{2}$ —10 $\frac{1}{2}$	1 c.c. to 4 c.e.	
17	Rongi Rahel	C3-N3	do. I.D.I.	5 1 9 1	1 c.c. to 21 c.c.	
18	Tushia Mahatan	C ₃ -N ₂	do. I.D.I.	71-101	1 c.c. to $3\frac{1}{2}$ c.e.	
19	Dhumi Mahatan	CN.	do. I.D.I.	7-10+	1 c.c. to 4 c.c.	
20	Nirodo Nirmata			C 101		
20	MIIOUA MITHIOTA	∪ ₃ -№ 9	uo. 1.D.I.	0-101	1 C.C. W 4 C.C.	

Leprosy Review

			1
Initial Bact. Exam. Results.	Final Bact. Exam. Results.	Results.	Remarks
RTBS ₁ 2/M, LTBS ₁ 3/M, nose negative	†RHC & LHC neg., chin neg., nose neg., RTBS, neg., LTBS 4/25*	Stationary	
R arm 2/1, RHC 2/3, RHE 1/M, nose neg.	R & LUF ₁ neg., LHE neg., RHE 4/M, granular forms RHC neg., chin neg., nose	Improved	
Nose 3/1, chin 4/1, RHE 8/1, LHE M/1, coccoids	3/M LHE & chin M/1, gran. forms and coccoids, RTBM, M/1 gran. form, nose M/1 + + +, RHE M/1 gran. form and coccoids	Worse	
Nose 26/20, RHE LHE M/1*, lepra cells	RHE & LHE M/1 $+++$, nose M/1 $+++$	Stationary	
RHÉ & LHE neg., chin 1/5, nose in small groups (intracellular forms)	RHE 1/M, LHE neg., RHC, LHC, chin 1/5, nose and RTBS ₁ —all negative	Improved	ording
RHE, LHE, chin & nose all M/1	RHE M/1, granular forms, LHE 80/20, chin 35/20, nose MM/1, intracellular forms	Very slight- ly Imp.	1 of Rec
Nose MMM/1, LHE 150/10, RHE in small groups	RHE & LHE M/1, granular forms, nose MM/1 intra- cellular forms	Stationary	Methoo
LHE 3/1, chin 6/1, nose M/1 in small groups	RHE 54/25, LHE 56/25, chin 5/20, nose 18/20	Stationary	с. Э.
RHE, LHE & chin M/1, nose intracellular forms	Nose M/1, chin 10/10, RHE M/1, LHE 10/15, smear too thin	Stationary	lds. Jy, 193 E. Mu
Chin 8/1, RHE 10/1, LHE 6/1, nose MM/1, numerous lepra cells	RHE, LHE, chin M/1, in groups, RHC 45/15, LHC M/1, nose M/1, lepra cells	Stationary	eld. 25 fie V., Jul sy'', (1
RHE, LHE & chin M/1, nose M/1. intracel. forms	RHE, LHE, nose M/1, intra- cellular groups, chin 40/15	Stationary	ch fi lli in ol. I epro
RHC 40/10, LHC 36/11, RHE 60/10, LHE M/1, in groups; nose M/1 in groups	RHJ, a few small groups of granular forms and coc- coids; LHJ, granular forms and coccoids; nose, intracellular forms; RHC M/1, granular forms & coccoids; LHC 10/50, granular forms & coccoids	Stationary	fany bacilli in ea tverage of 4 bacil brosy in India, V the Lesions of L
RHE M/1, LHE M/1, skin of nose M/1, nose	Ears M/1, granular forms; nose M/1, chin M/1, coc- coids LTBM 20/10	Stationary	1/1=N /25=1
Nose 4/1, RHC 10/1, coc- coids &granularforms LHC M/1, ,, , RHE, intracel. forms; L H E intracellular forms & scattered form, RHF & LHF M/1, gran- ular forms: LTBS 4/1	Ears and forehead M/1, granularforms; noseM/1 + + +, intracellular group and lepra cells	Stationary	* +-
Nose 2/M	LHE neg, nose intracellular forms, a few	Stationary	
Nose 2/M, LTBM ₃ (3 slides) 4/1, 3/1, 6/1; RTBM ₃ M/1, intra- cellular forms; chin M/1, intracellular forms	LTBM, 2/M, chin M/1 gran- ular forms and coccoids ; nose 2/M, RHC 20/10	Stationary	
Nose M/1, intracellular forms; RHE, LHE M/1: back 10/4	RHE & LHE M/1, coccoids; RHC 28/20; nose M/1	Stationary	
RHJ, LHJ & RHC M/1, LHC 6/1, nose M/1; lepra cells numerous	Ears M/1, chin M/1, skin of nose M/1, nose M/1	Stationary	
RHE 7/10, LHE 10/10, chin 60/10, nose M/1	Ears M/1, nose M/1++, chin 58/20	Stationary	
Nose M/1, intracellular forms; chin M/1, fore- head 6/12, granular	Ears and nose M/1, chin M/1, coccoids	Stationary	

11

The Management of Reaction.

GORDON A. RYRIE:

CASE of lepra reaction may present symptoms so insignificant from the point of view of the patient's comfort that little attention is required outside a temporary stoppage of specific treatment. On the other hand the condition may be so severe that prolonged hospitalisation is essential. Every case of reaction is essentially a case of leprotic instability which may be of good or evil import. It is necessary, therefore, by careful enquiry and examination to elicit the casual factors in this disturbance of the symbiosis of tissue and bacillus. further reason for close observation is that in a large number of cases improper management of the case will frustrate the effects of any specific treatment. Unfortunately it must also be admitted that in hospitals where modern facilities and drugs are not available, it tends to be assumed that nothing can be done for reaction. In such cases reaction tends to be regarded simply as an Act of God and the lepers' enemies-deplorable possibly, but not calling for active intervention. As it is of definite value to pool our experiences of leprosy work apart from specific accounts of drugs and statistics, it may be of interest to outline the general methods of management of a case of reaction as they exist in Sungei Buloh.

As far as possible even mild cases of reaction are treated in hospital, and preliminary stress is laid on careful enquiry and examination to elicit the precipitating factor. Workers of greater experience than myself will agree that it is unfortunately necessary to point out that a full clinical re-examination of the patient is essential and that such an examination cannot be conducted with rubber gloves on. In Sungei Buloh the vast majority of cases are precipitated by one or other of the following causes :—

- 1. Over dosage, over prolonged treatment or abrupt cessation of treatment with hydnocarpus derivatives.
- Concurrent disease. In the last year over 60% of patients who developed reaction had a positive Wasserman and Kahn. Mild helminthic infections appear to be a common cause. Chronic sepsis is one of the most frequent precipitating factors here.
- 3. Constipation.
- 4. Most Chinese and Malays, and many Indians attribute reaction to certain articles of diet. Prawns, shell-fish, ducks eggs, hot curries, snakes flesh, the flesh of an old fowl and bamboo shoots are the most frequently indicted. Possibly some of these are merely post-hoc impressions, others may be allergic.

- 5. Drug reactions. The effect of potassium iodide is, of course, well known. Patients, however, who supplement their legitimate treatment with Chinese or Ayurvedic medicines or Malay jungleherbs frequently develop a severe type of reaction. It is difficult to elicit a history in these cases.
- 6. Emotional Stress. Among women domestic strife before or during menstruation, the death of relatives, worry over debts or infidelities, are not infrequent precipitants of reaction.

Onset.—Cutaneous reaction begins as a rule here with a few days of mild localised nerve pain followed by the appearance of one or two isolated spots. These spots may (a) die away in abortive cases, (b) coalesce into spreading tuberculoid lesions, (c) become more or less generalised with fever as in the typical reaction case.

An interesting feature at this point and one that is sometimes of diagnostic value, is the absence of urinary calcium in about 20% of cases. As the condition improves calcium again appears in the urine. This is not due to any calcium deficiency but to an alteration in the mechanism of phosphatic and calcium excretion. The serum calcium in uncomplicated reaction is within normal limits. The test is very simple. To a test-tube of clear acid urine add a few grains of ammonium oxalate. If the normal calcium is present the urine turns cloudy owing to the formation of insoluble calcium oxalate. If the urine remains clear the patient is on the reaction threshold. By this means it is sometimes possible to detect a reaction before the spots appear. It should be remembered, of course, that the test is not specific and only applies to a limited number of cases. Sometimes, however, it is very useful.

A typical reaction here tends to fall into three stages which require different management. There is a first stage with more or less continuous but irregular fever and with pain and tenderness of the rose spots. In the second stage the temperature tends to be subnormal in the morning, rising to 100 deg. or 101 deg. F. in the evening. The rose spots may now present the appearance of purulent superficial blebs, which are really rich concentrates of mycobacterium lepræ and very useful for demonstration slides. There may be a difficult third stage with little or occasional fever, but marked by bone pains, joint pains, and increasing stiffness. The process may be aborted by lysis or crisis at any point.

During the first stage the patient is confined to bed on "absolute" rest and given a saline purge. The sedimentation test is over fifty—if not, the case is much more likely to be rapidly spreading tuberculoid leprosy. The patient is kept on a diet of bread, milk, eggs and fruit. The diet is of great importance, as treatment frequently fails because the patient is eating extraneous matter supplied by friends and relatives. In a series of cases of reaction treated with mercurochrome some time ago, it was found that while a number of dramatic recoveries were obtained in the male wards no single case appeared to be deriving benefit in the female section. It was found that among the females there was a regular custom of friends bringing in little dishes which they considered tasty or "cooling." When this practice was stopped the same percentage of recoveries was obtained as in the male wards. In any case of obstinate reaction therefore a rigid supervision of diet may be found to be of real help.

At this stage the question sometimes arises as to whether the reaction itself or the precipitating factor should be treated first. Sometimes the wealth of material elicited is embarrassing. In a recent case a young Chinese woman developed reaction after a violent quarrel with a neighbour. On examination, she was found to have gross pyorrhœa, a two-finger spleen, an helminthic infection, a retroverted uterus and a positive Wassermann. Except in cases where the probable precipitating factor is easily removed, I think it better to treat the reaction first. Where the reaction goes on for three weeks without responding to specific treatment the precipitating factor is dealt with in spite of the fact that this may cause a temporary exacerbation of the reaction.

A further feature of this first stage is the occasional appearance of a double peak in the temperature chart within twenty-four hours. This is similar to the double rise seen in kala-azar and S.T. malaria.

During the second stage of swinging temperature the patient may complain of feeling cold and may require an extra blanket. During this stage as well as in the first, plenty of Imperial drink seems to help the patient. We have found it advisable to treat the skin with an oily or glycerine emulsion as soon as the tenderness of the spots has subsided sufficiently to allow its application. The purulent blebs and broken sores are best cleaned with eusol or chloramine T. Sores on the back are covered with patches of gauze sealed round the edge with collodion. Calamine or dusting powders are unsuitable agents for reaction sores as they form a crust under which the pus accumulates. An occasional application of antiphlogistine is sometimes helpful in those cases where the sores tunnel in the superficial fascia.

In the third stage of post-reaction pain the patient is given full diet usually with the addition of liver soup. The important part of the management at this point is to ensure free and regular exercise of the smaller joints to prevent stiffening. With children, jig-saw puzzles and plasticene are useful for this purpose. Sleeplessness, owing to aching of bones and joints, pains along the leg veins or chronic malaise, may cause difficulty. An evening round is often helpful as the patient can frequently get a good night's sleep after a little suitable "therapeutic talk." We have found Dovers powder useful so long as the patient does not get drug-minded.

Treatment with hydnocarpus derivatives is not resumed for a full month after the reaction has subsided. In cases where the reaction has subsided, but where prolonged treatment for the precipitating factor is still necessary, no further leprosy treatment is given till this has been removed.

Curability and Relapse in Leprosy.

KENSUKE MITSUDA.

INTRODUCTION.

R. COCHRANE asked me to comment upon Dr. Rose's work, "The Curability of Leprosy." Owing to the delay in the arrival of his letter, and also to the confusion occasioned by the severe tidal wave at Osaka, which swept away Sotojima Leprosarium, resulting in the death of one hundred and seventy of the inmates, this contribution has been delayed.*

How to Discuss "Curability."

First of all, we must understand correctly the classification of leprosy before discussing its curability. Many workers have been misled owing to insufficient understanding of the classification of leprosy. The Manila Conference classified leprosy as neural and cutaneous. Neural consists of the macular type (we include maculotuberculoid) and neural type, while cutaneous signifies the nodular type of previous classifications.[†] Usually leprosy. as seen in Japan, begins in the macular type and advances to the more serious stage of neural leprosy, and some years later it passes into the cutaneous, nodular type.

^{*} We hope to give further details of this very regrettable catastrophe at a

^{atter date.—}*Editor.*The Manila classification of cutaneous leprosy included "all cases showing leprotic lesions in the skin" and therefore was not confined solely to the nodular type.-Editor.

Of course, there are many varieties; some neural cases remain as the neural type throughout life, and some pass into the cutaneous type several months after the appearance of macules or anæsthetic patches, but generally these two stages—neural and cutaneous—are consecutive. It would be irrational to endeavour to compare the prognosis of syphilis in the primary stage (chancre) with that, say, of syphilis in the tertiary stage (gumma), and therefore the endeavour to compare the prognosis of leprosy in the neural and cutaneous stages is, I hold, equally irrational. It is because of this attempt to do so that the problem of curability has become so very confused.

CURABILITY OF THE NEURAL TYPE.

Strange to say, there have been scarcely any reports about the curability of neural cases. Of course, there are a number of such reports, but for definite conclusions to be arrived at, prolonged observations are necessary. It is generally known that the macules tend to disappear with or without treatment, but such cases are seldom followed up over a period of ten years. For a discussion on the true prognosis of the initial neural case, it is necessary to observe continuously at least one hundred cases over a period of ten or twenty years. As leprosy is one of the most chronic of diseases, it would be over hasty to discuss its prognosis after only observing cases for three or four years.

Dr. Y. Hayashi once examined the initial symptoms of 1,284 leprous inmates in Zensei Hospital (265 neural and 1,019 cutaneous) and found that only 5.7% (7.1% of cutaneous cases) had cutaneous symptoms (nodules, infiltration, depilation of eyebrows) as the initial symptom. In other words, in 92.9% of all the patients the initial symptoms were neural. The question that needs consideration is what percentage of neural cases remain cured in the neural stage without any further symptoms except residual anæsthetic patches, and what percentage advance into the severe neural type, or pass into the cutaneous type. Such a report should extend over a period of at least ten years. It is the duty of doctors in charge of out-patient clinics to study the future and the prognosis of the initial neural cases after long observation. We may classify the results in primary

- (1) Those resulting in cure without relapse.
- (2) Those which advance to the severe neural type.
- (3) Those which pass into the cutaneous type.

We, indeed, know some cases in the first category, but do not know how many of these remain in this initial stage.



1. On admission.



2. After 3 years' treatment.



Blind and Relapsed.
5 years later.



1. On admission.



2. After 11 years' treatment.



3. Relapsed. 5 years later.



The Government Leprosy Asylum on the Island of Shikoku, near Oshima, Japan.



Dr. Fumio Hayashi welcomed back to Aiseien National Leprosarium, Okayama.

CURABILITY AND RELAPSE IN THE CUTANEOUS TYPE.

It is the cutaneous case which has been under discussion so frequently and by many workers. The theme of Dr. Rose's article related to the cutaneous type. Dr. Y. Hayashi has shown certain statistics on this subject. Dr. Hayashi has devoted seventeen years to the study of the problem in the Zensei Hospital, and was appointed Director there after my transfer to Aiseien. (F. Hayashi, a namesake, travelled round the world last year.)

Quoting his work, there were 850 inmates in Zensei Hospital in 1929, and out of this number 662 were cutaneous cases. Among them there were 128 advanced cutaneous male cases, who had at one time been considered in a stage of cure.

Duration of apparent recovery (in years) 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 18 Number ... 10 16 14 20 13 12 10 2 14 1 6 4 2 2 1 1

The average number of years freedom from the disease was 6.5 years and then relapse followed. Among these, 13 patients experienced recovery twice, and the second relapse took place on an average of 4.5 years afterwards. These statistics were compiled from data concerning relapsed cases, therefore it is impossible to say that every case takes this course. We may classify the results in cutaneous cases as follows :—

- (1) Relapsed cases.
- (2) Cutaneous cases which show almost no improvement with treatment.
- (3) Recovered or recovering cases :
 - (a) Those who will relapse in the future.
 - (b) Those who suffer no relapse during lifetime.

The first group has been discussed already, and the second is not pertinent to this article and therefore the third group alone remains.

Improvement in leprosy in most of the cutaneous cases with, or sometimes without, treatment, is common, but the question is how many have no relapse during life. After a long experience I can say that only 0.5%, or at the most under 1% of cutaneous cases autopsied had no tendency or possibility of relapse in the future. For such a conclusion it needs at least 10—15 years observation after the recovery of the patient. We must not confuse this relapse with that of neural cases.

Relapsed Cutaneous Cases.

I enclose some photographs of typical relapsed cases. They all at one time passed through a recovered stage for 5—10 years before relapse. The second picture is after one or two years treatment in the hospital. Many readers will remember a photograph of an old Japanese man in the book "Leprosy," by Rogers and Muir (page 287); the case also relapsed with many nodules on the face and extremities after 10 years in the cured stage. He died in 1931.

The General Course of Cutaneous Cases (in 70% to 80%).

I may also say that the leprolin test should be tried before discussing curability, prognosis and relapse. For this I would refer readers to an article by Dr. F. Hayashi, published in the *International Journal of Leprosy*, No. 1, January, 1933.

As I mentioned, prognosis in the neural and cutaneous stages are quite different, so it is necessary first to classify these two types exactly, and in this the leprolin test helps us greatly. They say that such and such a drug is very effective, that maculæ disappeared in several months with the treatment. But, in fact, generally most of the maculæ disappear in several months even without treatment. Curability of neural and cutaneous cases cannot be discussed together because each has a different prognosis. For this reason they are described separately.

SUMMARY.

In the article which appeared in LEPROSY REVIEW concerning the Curability of Leprosy, the author states that the reason for writing it is that some leprologists are optimistic concerning treatment, while others are equally pessimistic. These comments are written in an endeavour to emphasise as far as possible the facts as we have seen them. The first point stressed is that investigation should be made with regard to the percentage of neural cases which remain in a cured state throughout life.

Secondly, it is stated that 80% of cured cutaneous cases relapse, the remaining 20% include :—

- (a) Patients with no recovery.
- (b) Patients recovering, or recovered, who have had previous relapses and may have them in the future; and
- (c) Those without relapse.

We have received the following further comments on Dr. F. G. Rose's article, "The Curability of Leprosy" published in the October issue.

From Dr. H. W. WADE, Pathologist to the Leonard Wood Memorial for the Eradication of Leprosy.

The article on the "Curability of Leprosy," by Dr. Rose, of British Guiana, is in several respects so interesting that I am happy to accept an invitation to comment on it. This is done necessarily as one whose viewpoint is not primarily clinical, and who has had no connection with actual treatment of cases for ten years.

One is inclined to wish that the title of this report might have been in effect "The Efficacy of Chaulmoogra Treatment of Leprosy "instead of the more general one actually used. One happens to know that there is in press an article with much the same title by Dr. Lie, of Norway, a historical study dealing entirely with curability as seen in patients without such special treatment-a large group of whom Rose hardly more than mentions in passing. The feature of Rose's experience that is of special interest is that chaulmoogra treatment has increased greatly the number of arrested and apparently cured cases. This brings out anew the old but still unanswered question of why it is that such treatment obviously does good—often much good—in some regions, while in others it apparently does not, so that in such places it has come to be looked on with more or less complete scepticism. It is well for leprosy work as a whole that the discouraging results reported, for example, from Hawaii and Basutoland, can at least to some extent be counter-balanced by more encouraging experiences, of which these of Rose are peculiarly outstanding.

The author does not discuss the opinion of some, who are doubtful of the value of special treatment, that the improvement of cases under treatment is due to improved living conditions consequent upon hospitali-He does not say what percentage of the cases hospitalised before sation. the treatment period (i.e., before eight years ago) is represented by the 180 cases that became arrested spontaneously, but it would be surprising indeed if it were anything like 47 per cent. That, it may be noted, is the proportion represented by the 179 arrested and quiescent cases out of the 381 that were treated long enough to receive 100 c.c.—a low minimum -of drug. Be that as it may, it would be difficult to explain away the data on deformity, which are probably quite unique. No less than 61 per cent. of the cases becoming arrested and quiescent under treatment are reported as free from deformity, and 70 per cent. of the 142 earlier cases that have attained that stage. In contrast, all of the 180 old, spontaneously arrested cases had deformities. All but four of them had been neural in type; the cutaneous type had very little hope in the pretreatment days. Separate figures by type for the treated cases would be interesting.

One is much inclined to take wholly amiable issue with Rose with regard to his proposal to apply the term, for example, "arrested with recovery" to cases that have become arrested without deformity—i.e., without paralysis or loss of digits. Several years ago Rose introduced, or at least such is our understanding, the practice of distinguishing among apparently cured cases those that were deformed and those that were not. This was taken up by the Leonard Wood Memorial Conference when it proposed "arrested with deformity" for the old term "burnt-out," and it has seemed entirely satisfactory. It has the advantage over "arrested and recovered" but there is no ambiguity; many use "recovered " in quite the same sense that " arrested " is used in the present connection. Further, recovered seems to imply the regaining of something once lost, whereas the undeformed state is more often due to the avoidance of a condition than the recovery from one.

By no means the least interesting feature of Rose's report is the data on relapses. In the first place, the follow-up is exceptional. Of the total of 801 cases dealt with, only 36 were lost to sight; even eliminating the 138 deaths and 16 emigrations, leaving 647 cases, the disappearance rate is only 5.6 per cent. This certainly entitles the author to draw more definite conclusions than is possible in most places. One ventures the remark that, even under circumstances as favorable as those described, the disappearance rate will still be inversely proportional to the energy and persistence of those seeking the patients.

The experience with frequence of relapse in British Guiana is, in part at least, in agreement with that here in the Philippines, though conditions here do not permit such conclusive findings or such satisfactory results. Analyses have shown that, as in British Guiana, relapses are most frequent in the first two years after the patient is first put on the "negative list," and there has been analogous experience as regards insufficiency of treatment after that stage has been reached. That there is at least one country where follow-up and after-treatment are reasonably satisfactory, and that in that country the relapse rate is reasonably low, is indeed encouraging to those who believe that people who have once had active leprosy and who have become cleared up as a result of treatment ueed not necessarily be looked upon as a leper for ever after, but should be considered and dealt with rather as are those who have recovered from clinical tuberculosis, in whom it is expected as a matter of course that bacilli in a quiescent state may persist indefinitely thereafter.

From Dr. JAMES L. MAXWELL, Medical Adviser to The Mission to Lepers in East Asia.

Our present knowledge on the results of the treatment of leprosy is most satisfactory. Reports which I receive from a number of centres, which include both those where systematic and very haphazard treatment are carried out, are strangely discordant as to results, some enthusiastic, some pessimistic, even from places where the same methods of treatment seem to be employed. This is true as to both of the two main problems.

- 1. The number of "arrested" cases with complete restoration of function.
- 2. The percentage of relapses after discharge of such cases.

To deal with these separately :—

(1) The value of chaulmoogra and its derivatives is freely acknowledged from all the places from which I get reports, but there is no general consent as to the form of drug preferred. Some of the most successful workers are entirely satisfied that the whole oil is most effective, but equally confident reports come from others that use the ethyl esters and from some of those who employ the sodium salts. Extraordinarily good results are being secured by some workers by out-patient treatment. I speak of this from personal observation, but best results doubtless come from established colonies. I could mention, however, at least one of these where the results are of the poorest.

Of the value of the drug, there is, in my judgment, no possible doubt, but only if it is combined with other factors of which I should place in order of their importance, the treatment of concomitant diseases, the psychological factor of a belief in the patient's mind of the curability of

LEPROSY REVIEW

his disease, and the acquisition of hygienic habits in relation to food and exercise. The last I regard as of great value, the first two as almost essentials, without which the drug treatment is of comparatively little use. With these three, combined with the drug treatment, there are few cases indeed which will not improve, and there are large settlements in the Far East where, over a period of years, the death-rate has been reduced to two per cent. per annum, though no selection is made in the admission of cases, most of which are advanced.

(2) The problem of relapses is a very serious one, but frankly the number that relapse is smaller than might be expected in view of the very adverse conditions that these people have to meet when they are sent home from a leprosy settlement. They are suspect to their neighbours, they find it difficult to get employment; their economic position is therefore very bad, food even may be scanty and morale is lost. In the kindred disease of tuberculosis such conditions would make relapse even more frequent than in leprosy.

From Dr. LORNE WHITAKER, Medical Officer, Purulia Leprosy Home and Hospital, India.

Dr. Rose's paper deals with an aspect of the subject of leprosy that is of great interest to everyone treating patients suffering from this disease. We regret that we must state that we are not in a position to compare the figures given in this paper with the results we have obtained in the past years in this district. There are various reasons why we cannot do so.

Purulia is situated in a district where leprosy is quite common. Patients come to the Home for admission from many miles distance. The patients who have been admitted come from numerous districts and consequently when they are discharged as Disease Arrested and do not return we conclude that they remain in that condition since, in spite of repeated requests we often do not hear from them again. In the second place a great number of the patients who attend the out-patient clinics and numerous in-patients, leave before the course of treatment is completed and are lost sight of. Thus any estimate of percentages would be entirely fallacious.

The policy of the institution in the past has been to put a bacteriologically negative case on parole for six months and then to discharge him with instructions to return for periodic examination. We have not been able to carry on with out-patients after treatment because of the great distances from which patients come. We are convinced from our experience that such follow-up treatment would be of value in preventing relapses.

Finally, there are numerous patients, who are sometimes termed "burnt-out," who have no homes to which they may go. These are kept within the Home till they die. Hence these should be classed as Disease Arrested in any estimate of results obtained since active signs of the disease have disappeared.

In view of the above we do not feel justified in doing more than stating that during the past six years 55 patients have been discharged as symptom free. This corresponds to the Arrested and Recovered Class of Dr. Rose. Of these, nine have relapsed. Of the Disease Arrested cases which correspond to Dr. Rose's arrested but not recovered—one has returned as a relapse, with six returning on account of trophic ulcers and other surgical conditions, but no signs of activity. On the basis of these figures, 12.2 per cent. of the cases discharged have relapsed, although the introductory comments should be kept in mind when this is read.

We do heartily concur in the opinion of Dr. Rose so far as the treatment of children is concerned. Having a Nursery, Healthy Girls' and Healthy Boys' Homes, as well as Observation and Tainted Boys' and Girls' Homes, we have opportunity to watch the progress of treatment. In such patients the response is most heartening.

We feel that Dr. Rose has a much more ideal place in which to work from the point of view of following up his patients. Such work would only be possible here were there a much larger staff and a greatly enlarged medical budget. It does represent an ideal and we appreciate the assurance which his report brings of the results of which we cannot be sure here.

From Dr. L. E. S. SHARP, Medical Officer in Charge of the Leprosy Colony at Bunyoni, Uganda.

You kindly ask me to comment on Dr. Rose's figures and conclusions. The point which strikes me most forcibly is that the article as a whole further tends to confirm the growing volume of opinion, that we have not yet at our disposal the drug we need for treating leprosy.

- To select points from his article :---
 - (1) "Of 647 known cases, 180 are cases which have been spontaneously arrested with deformity, and have not received treatment during the last eight years."

That is to say that 28% of advanced nerve cases became arrested spontaneously.

- (2) As regards early cases, it is generally claimed that about 40% will become spontaneously arrested. And in Dr. Rose's cases about 39% became arrested when treated. One is tempted to ask in what way has treatment caused improvement, judging from the figures alone? In confirmation of which argument, Dr. Rodriguez in his article concludes that chaulmoogra treatment in early cases is "perhaps useless," a conclusion which I have found it impossible to avoid from a study of my own statistics for recent years.
- (3) I have had little experience of relapse incidence, as the Bunyonyi Colony has been functioning for only four years, but one notes that Dr. Rose states, "It was not until 1929 that it became apparent that the percentage of relapses was so high as to cause grave doubts as to the permanence of the results achieved."

He now advocates six years' treatment after arrest, to ensure a cure. One would suggest that after six years' arrest a spontaneously arrested case might also be regarded as cured.

(4) In Table 2, Dr. Rose shews 10% of recovered cases among advanced cases.

Unless I have misinterpreted his figures, this 10% does not appear to be an improvement on his 28% spontaneously arrested (quoted above).

(5) On the other hand, Dr. Rose's photographs of C3 cases improved under treatment are very convincing, and shew that when chaulmoogra products can be brought in actual contact with M. lepræ, the latter is eliminated.

The interesting article by Dr. Rodriguez, claiming that chaulmoogra derivatives only attack the acid-fast forms of M. lepræ explains a great deal which before appeared so contradictory in the results published.

For instance, it has been claimed that other bactericides, such as brilliant green, produces at least as good results as chaulmoogra—my own figures seem to support this. Is it possible that the action of chaulmoogra is most effective when brought in chemical contact with the bacillus, apart from which it has little effect, if any? If so, we may confidently look forward to the day when research will place in our hands a better remedy than chaulmoogra, which would at least deal rapidly and effectively with M. lepræ when it reaches the skin.

From Dr. N. E. WAYSON, Surgeon in Charge of the Leprosy Investigation Station, Honolulu, Hawaii.

The article is misleading, and is evidently written by someone who is imbued with the idea that "It is important, therefore, that this atmosphere of doubt should be cleared as far as possible." The writer is labouring under the impression that prophylactic measures are to be accomplished by curing a disease after it has become sufficiently disseminated and advanced in an individual to be recognised by our present criteria of diagnosis. Furthermore, his figures are distinctly misleading, as are likewise the photographs which he has included. The latter are not taken at the same range of focus, some are distinctly blurred. You will note that of his 647 cases, 27.8% have spontaneously become arrested (this in itself is highly significant); of his group of 467 receiving some treatment, 20.9% have become arrested; and of his 381, which have received what he considers adequate treatment, 25.7% have become arrested. In other words, the treated cases have, on the face of his returns, shown a lower rate of arrested cases than those which were let alone. There are several other manifestly gross errors or fallacies in his figures.

Preservation of Iodised Hydnocarpus Esters

Recent experience has shown that iodised hydnocarpus esters may become irritant on prolonged exposure to air and that this process is probably accelerated in the presence of water.

The stock of esters should, therefore, be kept in nearly full containers to reduce contact with the air as much as possible. Where iodised esters have to be imported in bulk, the contents of each large container might be transferred locally into glass bottles large enough to provide, say, not more than one month's supply. The glass bottles used should be sterilised by dry heat and should be thoroughly dry when the drug is transferred. The bottles should be kept well-corked and in a cool, dark place.

If iodised hydnocarpus esters are sterilised by steam before injection they become wet. There is no objection to this so far as immediate injection is concerned, but only the quantity necessary for immediate use should be so treated, and any steam-wetted residues should not be returned to stock bottles. Similarly, wet syringes should not be used to withdraw iodised esters from the stock bottles.

We have been asked by the Wellcome Chemical Research Laboratories to draw the attention of our readers to this matter, and we are very glad to do so.—Editor.

The Bankura Leprosy Investigation Centre.

E. MUIR and K. R. CHATTERJI. (Reprinted from "Leprosy in India," July, 1934).

INTRODUCTORY.

THERE are many problems connected with leprosy which cannot be thoroughly investigated in an urban centre such as that at the Calcutta School of Tropical Medicine. Leprosy is primarily a village disease and it is in rural conditions that its epidemiology and its control can be most conveniently studied. The truth of this statement will, it is thought, be borne out by this paper.

LOCATION.

Bankura was chosen for several reasons. It is one of the most highly endemic areas in India. It is within six hours run by train from Calcutta. There is already a leper home under the Mission to Lepers with some 150 beds, and there are several special leprosy clinics under the District Board. There is also a medical school in the town of Bankura.

The Bankura District is divided into two sub-divisions. Sadar and Bishnupur. The former has a laterite soil, and is poor in fertility and subject to periodical famines; the incidence of leprosy is far higher than in the Bishnupur sub-division which has a more fertile alluvial soil. The Sadar subdivision (population 788,608) is divided into 13 thanas. After a preliminary survey it was resolved to concentrate on the Sadar thana in the centre of which is the Bankura town. This thana has a population of 109,706 inhabitants and contains 11 smaller divisions under Union Boards. Each of these Union Boards has on an average some 7,000 inhabitants and contains 25 to 30 villages. The eleven Union Boards of the Sadar thana were visited in turn and the methods of leprosy control explained to the villagers with a view to ascertaining what amount of local co-operation would be available. The Achuria Union Board was fixed upon for the initial experiment.

LEPROSY CONTROL.

The procedure adopted is as follows. The investigation party consists of three doctors experienced in leprosy work, and five trained but unqualified assistants. Accommodation was kindly given in some buildings connected with the leper home, but the doctors found quarters in the town of Bankura. Bicycles were used for reaching the villages. The Achuria Union Board was visited and a leprosy executive appointed. Their duties are (a) to choose suitable representatives from each village to be formed into the Union Board Leprosy Committee, (b) to arrange for the building of a clinic, (c) to arrange for local volunteers to help in the work and especially for doctors to run the clinic, and (d) to raise funds to meet the clinic and other expenses. The Leprosy Committee is responsible for all the anti-leprosy work in the U.B. area; each committee member is responsible for anti-leprosy measures in his own village.

The party next carried out a house to house leprosy survey, a list being made of all cases, divided into highly infectious, slightly infectious and non-infectious. Those diagnosed on clinical grounds, but found on routine examination to be bacteriologically negative, were classified as noninfectious, and those found bacteriologically positive as infectious cases. In the Achuria Union Board area the survey showed 27 highly infectious (C-2 and C-3), 26 less infectious (C-1) and 92 non-infectious cases. Unfortunately objection was made to examination by some Mussalman villages, so that the survey could not be completed. The clinic building having been erected the local doctors were at first assisted on clinic days by doctors belonging to the party until the former became sufficiently proficient and were able to run the clinic without outside assistance. The Leprosy Committee is responsible for seeing that all leprous patients within the area attend the clinic regularly once a week.

Seeing that infection is spread by the comparatively small number of infectious cases it is considered very important that all such cases should be effectively isolated; otherwise treatment alone is unlikely to control the disease. Thus the most important function of the U.B. Leprosy Committee is to arrange for isolation and see that it is carried out. Chief stress is laid on the isolation of the highly infectious (C-2 and C-3) cases.

Isolation is of two kinds. For the comparatively wellto-do-villagers arrangements are made within the house compound, a room being set aside in such a way that contact with other members of the family, and specially with children does not take place. Fig. 2 shows a simple method of isolation. A small hut is built in the compound, but with the door opening directly out of the compound. The windows of the hut, however, open into the courtyard, so that, while direct contact is prevented, conversation can be carried on with relatives and food can be handed through the windows. This illustrates the principle and shows the degree of isolation necessary to prevent the spread of infection; but many modifications can be improvised to suit the type of compound and habits of the people.

For indigent infectious patients isolation is arranged outside the village, a plot of land being set aside by well-todo villagers on which the leper or his friends may build huts and on which he can grow a few simple crops with which to support himself (Figs. 1 and 3). School children are encouraged to collect rice, dal, etc., from door to door to feed those who are unable to support themselves adequately by their own labour.

Voluntary isolation of lepers is no new thing in India. It has been practised among the aboriginal tribes all over the country from time immemorial. Ignorance, however, often renders it ineffective, as the infectious cases are not recognised, and often the only cases isolated are maimed cripples in whom active disease may have already died out. In actual practice we find that there is little difficulty in persuading the poor to isolate themselves; the public opinion of the village sees to that as soon as it is definitely known that an individual is a danger to the community. With the well-to-do and influential the case is different; they are more in a position to defy public opinion, and in some cases pressure from authorities outside the village may be necessary.

It will be realised that in order to carry out a scheme such as the above a tremendous amount of propaganda and persuasion is necessary. This is primarily supplied by the investigation party; but once the more educated and intelligent members of the community have become convinced, they become responsible for carrying on propaganda, enforcing isolation and seeing that treatment is carried out regularly.

We have already noted that certain Mussalman villages could not be surveyed due to objections raised by the inhabitants; but there are known to be at least 76 cases among them. It is interesting to note that no fewer than 21 non-infectious and 33 infectious Mussalman cases are voluntarily attending the clinics, it is thus likely that the opposition raised by those villages will in a short time give way.

As mentioned above, house to house survey of the Achuria Union Board area, apart from the Mussalman villages, showed 53 infectious (C-1 = 26, C-2 and C-3 = 27) and 92 non-infectious cases. Of these 53 infectious cases,

36 may be counted as more or less indigent; 19 out of these 36 are highly infectious, 16 of which are non-isolated; and 20 are slightly infectious, only one of which is as yet isolated. Those belonging to well-to-do families number 17 (C-1 = 9, C-2 and C-3 = 8) and of these only two are yet effectively isolated. Of the 221 known cases of leprosy in the Union Board area, 155 are attending regularly for treatment.

It is obvious that prolonged propaganda must be continued if the disease is to be controlled. After three months, 16 out of 19 (84 per cent.) highly infectious indigent cases are isolated, but only two out of eight (25 per cent.) well-to-do infectious cases are isolated. Social and hygienic education must be given time to grow, and public opinion will, it is hoped, gradually take shape as the effects of isolation gradually become evident. One leading villager had already isolated his highly infectious wife for a number of years with the result that the disease has not spread to the other members of the family. This fact being generally known to the villagers has formed a very effective piece of propaganda in persuading others to act similarly.

OTHER UNION BOARDS.

While the attention of the investigation party has been concentrated on the Achuria U.B., other Union Boards have also been kept in close touch. Committees have been formed and clinics are in course of construction. The following is a list of such activities :—

Purandarpur Union Board.-A leprosy committee, an executive body, and a volunteers' committee have been formed. The Union Board President is the President of the Leprosy Committee. The clinic house of this Union, the gift of a local magnate, is still under construction. Four medical practitioners in this area have agreed to give their services free in running the clinic. The investigation party has commenced work in this Union, and has already surveyed 19 villages and detected 66 cases of leprosy. Of these 43 are non-infectious and 23 infectious cases. Of the 23 infectious cases 10 are only slightly infectious and have not yet been segregated. The remaining 13 cases are highly infectious, and of these three are already effectively isolated, while there is hope that the remaining 10 will also be in about a month's time. As soon as the clinic is completed, treatment of all cases will be begun.

Kalpathar Union Board.—Here a leprosy committee and an executive body have been formed. In this place the clinic building, which is under construction, is the gift of the Union Board President, who has also been elected as President of the Leprosy Committee. The investigation party intend to concentrate on this Union after they finish the previous one.

 \hat{J} agadalla Union Board.—A leprosy committee with an executive body and village sub-committee have been formed. Three medical practitioners of this Union are willing to render free service to the clinic. One eminent doctor of the town has consented to bear the cost of erecting a shed and the expense of one year's medicine.

Narra Union Board.—A leprosy committee and an executive have been formed. A doctor has agreed to render free service to the clinic. The Vice-President of the Union Board has given a piece of land for the clinic, and the President has agreed to bear the cost of the building.

Sanbandha Union Board.—A leprosy committee and an executive body are formed. A doctor has agreed to run the clinic. Arrangements are in progress for the erection of the clinic and for raising funds.

Junbedia Union Board.—A leprosy committee and subcommittee have been formed.

CONCLUSIONS.

Work has more or less been started in seven out of the eleven Union Boards of the Bankura Sadar thana. The first centre has necessarily been the most difficult to deal with, as the scheme was new and the Investigation Party had not then the experience in this type of work which they have now gained. It is hoped that this method of leprosy control will gain in popularity as it advances and as its results begin to show themselves and that Union Boards in other thanas will themselves take the initiative in dealing with the disease.

Several doctors from other parts of India have already visited the centre and have expressed great interest in the methods adopted. It must, however, be noted that the already organised Union Board system is a great asset in this form of leprosy control, and where these Boards or similar organisations do not exist a considerable modification of method may be necessary. In more backward provinces the zemindar may have to take the place of the Union Board in arranging for buildings, organisation, and finance.

In this paper we have confined ourselves to leprosy control. Another paper will presently be published dealing with the question of epidemiology as brought out by the careful study of the spread of leprosy in families.





Fig. 2. Plan for isolation within the compound



Fig. 1. Patient isolated outside the village.

> Fig. 3. Three infectious brothers isolated in a hut outside the village.

(Reprinted from "Leprosy in India")



Map of the Anglo-Egyptian Sudan, showing the rainfall (in inches) at certain of the principal towns.

The Distribution of Leprosy in the Sudan with Reference to Climate and Diet.

O. F. H. Atkey.

(Reprinted from "International Journal of Leprosy," Vol. II, No. 2.)

INTRODUCTION.

THE Sudan as regards climate can be divided roughly into three zones: 1, A northern desert zone extending from the Egyptian border (about the 20th parallel) to the 15th parallel just south of Khartoum. 2, A central pampas zone, extending from the 15th parallel to the 12th parallel, with a short, well-defined rainy season of from three to four months. 3, A southern tropical zone extending from the 12th parallel south to the Uganda border at about the 4th parallel.

The northern and central zones are for the most part inhabited by Arab tribes or by Hamitic tribes approximating the Arab in race and culture, but the central zone also includes localised areas of hill-dwelling Negroes that are few and widely separated in the northern part but form large agglomerations as the 12th parallel is approached. The southern tropical zone is inhabited by Negroid tribes, though the Arabs in their seasonal migrations penetrate this area as far as the 10th parallel.

As regards the northern and central zones the inhabitants can be divided into two main classes, the nomads and the settled population. The former live in goat-hair tents or in shelters of grass mats, and their seasonal migrations are regulated by the rains, the grazing and the fly. Their staple diet is milk, grain is available in limited quantity, and meat is eaten on festive occasions. The amount of milk consumed is very great, and is larger among the camelowning nomads of the north than among the cattle owning nomads of the central zone.

The settled population in the northern area is almost entirely confined to the banks of the Nile, where they cultivate by water wheel. They have considerable numbers of sheep and goats, but camels and cattle are few as there is little grazing away from the river. The staple diet here is grain; milk is drunk but is available only in limited quantities, and meat is eaten occasionally. In the central zone the settled population is not limited to the river, but permanent villages are formed near wells in areas where the soil is good for rain cultivation. Here also the staple diet is grain, but there is grazing for a considerable part of the year and in consequence flocks and herds are numerous, so more milk is drunk and meat is more frequently eaten.

As regards the southern zone the population can again be divided into the agricultural and the pastoral, but south of the 8th parallel there are large areas where cattle cannot live and where goats can be kept only with difficulty and in very small numbers. In these areas milk is not drunk and meat is eaten only when game or vermin can be killed.

	TOWNS IN THE SUDAN."	
Town.	Province.	Rain fall.
Suakin *	Kassala	7.17
Kassala	Kassala	12.68
Khartoum	Khartoum	6.22
Wad Medani	Blue Nile	15.63
Ed Dueim	White Nile	11.85
El Obeid	Kordofan	13.82
Singa	Fung	21.97
Kodok	Upper Nile	28.50
Malakal	Upper Nile	34.49
Gambeila	(Abyssinia)	48.11
Wau	Bahr el Ghazal	43.50
Juba	Mongalla	35.71
¹ Arranged	geographically, from north to south	1.

^a On the Red Sea littoral.

GENERAL DISTRIBUTION OF LEPROSY.

In the northern and central zones leprosy is uncommon except among the hill-dwelling Negroes referred to. It is rare among the nomads, very rare among the camel owners, and rare also among the cattle-owning nomads. Among the settled Arabs the disease is found more commonly than among the nomads. It is commoner among the settled Arabs of the northern zone where the grazing is very limited, than among the settled Arabs of the central zone where the grazing is plentiful for a considerable part of the year. Among the hill-dwelling Negroes in the south of the central zone the disease is common.

In the southern zone, south of the 12th parallel, the incidence of leprosy is considerably increased, but the increase is for the most part restricted to the areas infested with the tsetse fly (*Glossina morsitans*). The cattle-owning Negroids inhabiting the Nile basin between the 12th and 6th parallel and extending east to the Abyssinian border are remarkably free from the disease. On the other hand it is common in the fly-infested country to the east of the river valley, and the incidence becomes increasingly severe as the heavily infested fly area adjacent to the Nile-Congo divide is approached. On the eastern side of the river valley, as the country stretches up to the Abyssinian plateau, the fly

disappears and cattle and game become very numerous; with this leprosy becomes increasingly rare.

The detailed distribution and incidence of leprosy in the Sudan, as far as it is known, is given below.

INCIDENCE OF LEPROSY, BY PROVINCES.

NORTHERN SUDAN.

Berber Province.—Latitude 22° to 16° N. Rainfall very slight. Population 175,186; settled riverain cultivators and camel-owning nomad Arabs. Leprosy: 42 cases, 35 male and 7 female, all of whom are settled Arabs.

TABLE 2.—Average Relative Humidity, October to March, at certain places in the Sudan.'

Place	Province	Humidity.						
Thee	Trovince.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
Wadi Halfa Khartoum Wad Medani Wau Mongalla	Halfa Khartoum Blue Nile Bahr el Ghazal Mongalla	34 30 43 76 77	41 28 32 67 71	49 30 33 50 59	47 29 33 41 48	37 22 26 39 49	29 16 20 43 53	

¹ Arranged geographically, from north to south.

Dongola Province.—Latitude 20° 15' to 17° 30' N. Rainfall negligible. Population 187,346; settled riverain Arabs and camel-owning nomads. Leprosy: 52 cases, 43 male and 9 female, of whom 51 are settled and one is a nomad.

Halfa Province.—Latitude 22° to 20° 15' N. Rainfall negligible. Population 60,900; sparse, isolated and riverain. Leprosy: 1 case, male.

Khartoum Province.—Latitude 17° 30' to 16° 45' N. Rainfall 6.2 inches. Population 278,594. The town population is very mixed and drawn from various parts of the Sudan. Leprosy: 22 local cases were reported during the last five years.

Red Sea Littoral.—Latitude 23° to 18° N. Rainfall at Suakin 7.17 inches. Population 23,788; camel-owning nomads and mixed town population. Leprosy: 11 cases, all males, of whom 5 are Arabians (from Arabia), 2 West Africans, one a Negroid from Darfur, and one a nomad Arab.

CENTRAL SUDAN.

Blue Nile Province.—Latitude 15° to 14° 30' N. Rainfall 15.6 inches. Population 453,950; settled and nomad Arabs and immigrants. Leprosy: 16 cases, 12 male and 4 female, of whom 3 are foreigners, 4 Negroids, 4 nomad Arabs and 5 settled Arabs. None of these are native to the province.

Darfur Province.—Latitude 17° 30' to 10° N. Population 712,191; settled Arabs and camel-owning nomad Arabs in the north, settled Negroes and cattle-owning nomad Arabs in the south. Leprosy: no detailed figures are available, but the disease is reported to be (a) almost unknown among the camel-owning nomad Arabs of the north; (b) rare among the cattle-owning Arabs of the south; (c) uncommon among the settled Arabs; (d) very common among the Furs, a Negro race owning few cattle; (e) common among the Masalit, a Negro tribe who are also settled agriculturists but who own more cattle than the Furs.

Fung Province.—Latitude 14° 30′ to 10° 30′ N. Rainfall in the northern part 21.9 inches. Population 237,127; settled Arab, nomad Arab and Negro. Leprosy : the figures for northern part of the province are fairly comprehensive; there are 7 cases, 6 male and 1 female, of whom 5 are Arabs and 2 Negroes, all settled. The figures for the southern part of the province, mainly inhabited by hill-dwelling Negroes, are very incomplete; 43 cases are reported, of whom 41 are hill-dwelling Negroes and 2 settled Arabs.

Kassala Province.—Latitude 18° to 12° 40′ N. Rainfall 12.6 inches. Population 364,481 ; nomad Arab and a mixed settled population, largely Negroid but with some settled Arabs. Leprosy : 26 cases, 20 male and 6 female, of whom 15 are Negroes and 11 settled, detribalised Arabs.

Kordofan.—Latitude 17° 30' to 10° N. Rainfall in northern part 13.8 inches. Population 1,120,507; camelowning nomad and settled Arabs in the north, cattleowning nomads and settled, hill-dwelling Negroes in the south. Leprosy: 66 cases, of whom 56 are hill-dwelling Negroes, 8 settled Arabs, and 2 nomad Arabs. The figures for the Negro population are very incomplete.

White Nile Province.—Latitude 15° to 12° N. Rainfall 11.8 inches. Population 431,913; mainly nomad and seminomad, with a small definitely settled riverain Arab population. Leprosy: 2 male cases, of whom 1 is a settled Arab and 1 a hill-dwelling Negro from southern Kordofan.

SOUTHERN SUDAN.

Bahr el Ghazal Province.—Latitude 10° to 5° 30' N. Rainfall 43.5 inches. Population 675,111. It is divided into :—

(1) Northern, Eastern and Rumbek districts in the river valleys lying between the Bahr el Ghazal and Bahr el Jebel. Population 354,392; cattle-owning Negroids (Dinkas), rich in cattle. Leprosy: 20 cases.

(2) Western and Central districts. Population 88,553; settled agricultural Negroids. A fly area stretches up to the Nile-Congo divide; no cattle except a few in the extreme east of the area. Leprosy: 567 cases reported, but there are said to be many more.

(3) Southern districts. Population 232,166; settled agricultural Negroids (Landi). Fly country adjacent to Nile-Congo divide; no cattle. Leprosy 4,734 cases, or 2.39 per cent. of the population.

Mongalla Province.—Latitude 6° to 4° N. Rainfall 35.7 inches. Population 322,598; Negroid cultivators on the western side of the river, Negroid cattle-owners on the eastern side, the cattle increasing as the river valley is left. Leprosy: 1,643 cases reported. The great majority of these are from the western side of the river, and they increase as the river is left and the heavily infested fly area is entered. By far the heaviest incidence is in Meridi district, which lies along the Nile-Congo divide. There are a few cases on the eastern side of the river in the river valley and the neighbouring hills, but as the country stretches up towards the Abyssinian border the cattle become numerous and leprosy is rare or absent.

Upper Nile Province.—Latitude 12° to 6° N. Rainfall 34.5 inches. Population 581,121; cattle-owning Negroids. Investigations concerning leprosy in the various tribes give the following figures : Shilluk, from 90,000 persons 16 active cases and 24 burned-out; Nuer, from 9,500 persons, 2 active cases; Shish and Atwot Dinkas, from 30,000 persons 10 active cases, 29 burned-out; Twi Dinkas, from 11,643 persons, 1 case; Northern Dinkas, from 20,000 persons, 2 cases. It is to be noted that the 9,500 Nuers examined constitute only a small part of a very large tribe. The Nuer and the Dinka are pastoral and nomadic to a greater extent than the Shilluk, who, though they have considerable herds of cattle occupy settled villages along the river and do considerable cultivation.

SUMMARY OF INCIDENCE.

In examining this statement of incidence there are certain features worthy of note :—

(1) That leprosy is almost completely absent among the camel-owning nomad Arabs. There are two relevant facts about these nomads, namely, (a) their isolation from external contacts, and (b) the very large quantity of milk at their disposal—more than they can drink. This is their staple diet, and often for long periods their only diet.

(2) That the incidence is very low among the cattle-

owning nomad Arabs, who have large quantities of milk but not the unlimited supply of the camel-owning nomads.

(3) That there is a definite but low incidence among the settled Arabs of the north, where the grazing is confined to the river edge.

(4) That this incidence is markedly diminished among the settled Arabs of the central zone where there is a definite rainy season and extensive grazing for a large part of the year.

(5) That there is a high but not yet determined incidence among the Negro races of the central zone. These people are hill-dwellers, this until recently being to gain refuge from the Arabs, but now from habitude. Their villages are cramped and overcrowded, and the grazing for their cattle is very limited. Grain is their staple food, and milk enters into their diet to a very limited degree. Salt is very expensive and is rarely eaten, but whether this is to a less extent than among the surrounding Arabs who are relatively free of the disease it is not possible to say at present.

(6) That in the southern zone, among the Negroids of the river plains who are herdsmen and whose staple food is largely milk, the incidence of leprosy is low, while on the other hand among the inhabitants of the fly country, where there are no cattle, its incidence is very heavy indeed, as high as 2.39 per cent. in the country adjacent to the Nile-Congo divide.

It is of interest to note that in this area of exceptionally heavy leprosy incidence the people are adequately lodged, and are well fed except for the absence of milk and the scarcity of meat and salt. There is an abundant supply of fresh vegetables and fruit, and fish are caught from time to time. The villages are well separated and each dwelling (of one or more huts) stands in its own plot of land.

CAUSATIVE FACTORS.

Is there any single factor that governs or predisposes to this distribution ?

(1) Dryness and Rainfall.—These afford no explanation. The settled Arabs of the dry and arid north are more heavily infected than the settled Arabs of the central zone with its definite rainy season. On the other hand, the camel-owning nomads of the north are freer from the disease than the cattle-owning nomads of a more southern latitude with a definite rainy season. Again, the Negroid herdsmen south of the 6th degree in the country east of the river stretching up to the Abyssinian and Kenya borders, are free of the disease, while the Negroid cultivators living in the same latitude near the Nile-Congo divide are very heavily infected.

(2) Altitude.—This does not affect the issue. The hilldwelling Negroids are more heavily infected than the surrounding Arabs of the plains, while the inhabitants of the high land on the Nile-Congo divide are much more heavily infected than the Negroid herdsmen of the Nile Valley.

(3) Salt.—There is a definite shortage of salt in the heavily infected Nile-Congo divide area, and the people show great eagerness to obtain it. It has been suggested that this deficiency of salt may be a predisposing cause towards leprosy. On the other hand, salt is probably as hard to come by among the Negroid herdsmen on the Abyssinia-Kenya-Sudan border, who are free from this disease, or among the Dinka herdsmen of the Bahr el Ghazal, who are only slightly infected with leprosy. Again, the Fur hill Negroes of Darfur, who make their own salt in plenty, suffer heavily from leprosy.

(4) Milk.—The one single factor which seems to correspond with the incidence of leprosy among the tribes of the Sudan, situated as they are under varying physical conditions of height, moisture and temperature, seems to be the presence or absence of cattle, sheep and goats and the use of their milk for food and drink.

Statement of Progress made in Leprosy Work in the Federated Malay States in 1933.

Gordon A. Ryrie.

(Reprinted from *Leprosy in India*, July, 1934.)

THE year commenced with 1,082 patients. In spite of the transfer of 100 patients to the Leper Settlement at Pulau Jerejak in Penang and the year's casualties and discharges, the numbers have risen to 1,104 and are steadily rising. The total number of people treated in the Settlement during the year was 1,531.

There has been an unprecedented rise in the number of admissions during the year, the total amounting to 449. It is noteworthy that the proportional number of women has increased and more than that of the males—the females have increased by 23.5%, the males by 8.5%. One gratifying feature of the increase in admissions is the definite rise in the number of Malays who are conservative in outlook and not easily persuaded to accept Western treatment. In 1932, eight Malays were admitted : forty-two were admitted in 1933. It is hoped that further admissions will make possible a further study of indigenous leprosy. There are obvious and striking differences in the type of leprosy affecting Southern Indians as compared with Southern Chinese. The fact that Malays are beginning to seek the benefits of anti-leprosy treatment may afford an opportunity to study further evidence with regard to racial modifications of the disease.

Another interesting feature of the admission rate is the relative increase during the months of September and December. On enquiry among the patients I find that they attribute the rise to the fact that descriptions of Sungei Buloh and its treatment were published in the vernacular newspapers in the months of August and November. The Malays declare that propaganda in the Malay newspapers would bring in many more cases.

It remains, however, to be admitted, that we have not yet in leprosy the rapidity of treatment results that would enable us to cope easily with a large influx of patients.

During the year 151 cases were discharged, the disease being arrested and the patients free from any danger to the public. This compares favourably with the discharge of 91 cases in 1932. These cases have undergone three monthly clinical and bacteriological examinations before discharge. As a result of economic conditions a large number of these patients have been exceedingly reluctant to leave the Settlement.

Fifty-two cases absconded—the large majority of these returned after a short time. Two points require mention with regard to this. One is that no restrictive means of any importance are taken to prevent a patient absconding if he wants to. The other is that they are seldom if ever the result of patients wishing to flee into hiding or to "escape" in the accepted sense. They appear to be the result, as a rule, of urgent private affairs outside, which require personal attention—usually either debts or infidelities. The number who abscond and neither seek re-admission into this or any other Settlement is probably negligible. The figure compares favourably with the 74 abscondings of 1932.

The number of deaths has fallen from 61 in 1932 to 55 in 1933, in spite of the increased numbers—a death-rate of 36 per mille as against 45 per mille in 1932. A curious

feature, which I am unable to explain satisfactorily, is that the number of deaths fell from 40 in the the first half of the year to 15 in the second half.

SUMMARY OF STATISTICS.

- 1. The numbers have risen from 1,082 to 1,104. A treatment of 1,531 cases in all.
- 2. There has been an exceptionally large rise in the admission of Malays and women.
- 3. The death-rate and absconding rate have decreased: the discharge rate has increased.

The interpretation of the favourable trend seen in these statistics is, I think, definitely due to continued improvement in treatment.

It was felt at the end of 1932 that the intramuscular and intradermal injections of fresh Siamese ethyl esters represented the best method of treatment that Sungei Buloh could reasonably recommend to patients. In accordance with this all other methods of routine treatment were given up and the organisation of intramuscular and intradermal esters injections was developed for the majority of cases. The Settlement has then been divided medically into four main groups : (1) The majority of patients on intramuscular and intradermal esters. (2) A subsidiary group unsuitable for esters who receive Tai Foong Chee. (3) A hospital group for medical and surgical cases. (4) Experimental group.

Intramuscular and Intradermal Ethvl Esters.—With persistent propaganda, improved organisation and insistence on regularity this treatment has become both popular and effective. It is particularly gratifying to see more and more patients voluntarily asking to be subjected to the painful process of intradermal injections. The figures speak for themselves. In the first half of 1932, 26 patients were receiving injections of ethyl esters. By the end of 1932 there were 225. In 1933, 671 patients received full courses. This increase is a very gratifying one and can justifiably be correlated with the increased number of cases who have been discharged. For a full course a patient receives 40 injections, rising from 2 c.c. twice weekly to the maximum he can tolerate as judged clinically or by the sedimentation In 1933, 24,374 intramuscular injections have been test. given, an average of 720 injections a week during the treat-This works out at an average of 36 injections ment periods. per patient. During the first half of the year there were a number of cases of abscess formation due to injections from a faulty supply of esters. It is, however, a tribute both to

the leper dressers and to the good quality of the esters that in the second half of the year with over 16,000 injections there was no single case of abscess due to injection.

In an increasing proportion of cases the larger doses of ethyl esters have been given subcutaneously instead of intramuscularly, in order to save induration of the routine round of alternate deltoid and gluteal injections. Absorption seems fairly rapid, and there is on the whole less pain. Strict asepsis is of course essential.

Intradermal Esters.—A total of 199 cases received combined intramuscular and intradermal injections. The total number of areas injected has been 2,169. These figures are still too low but they are nearly double the 1932 figures, and the year 1934 starts with a still increased number. In spite of the painful and tedious nature of this treatment it is growingly popular and in our experience represents by far the best form of treatment available. Cases treated with intradermal esters show over 80% local improvement. As a result of esters treatment generally 587 cases out of a total of 671 show varying degrees of improvement-85%. Fifty-three cases, or 8%, showed no change. Thirty-one, or $4\frac{1}{2}$ %, were worse. No case was given esters during the period of or for a month after lepra reaction. In non-reaction cases with erythematous raised lesions of under twelve months duration we have obtained no improvement with esters treatment.

Tai Foong Chee.—The year began with 393 cases on Tai Foong Chee. The number fell during the year to 126, and its use is restricted to advanced non-resisting cases. There is some evidence that this drug helps to check the advance in such cases towards the mutilation of advanced phases of the disease. Advanced cases believe in it and apparently derive a certain amount of comfort from its administration in spite of the gastro-intestinal irritation that may follow from prolonged dosage. Our policy is now to confine the administration of Tai Foong Chee to intractable cases and to those who are too senile or advanced for energetic treatment. Out of 252 cases who had uninterrupted courses of Tai Foong Chee, 218 claimed varying degrees of improvement. Six or 2.4% showed no change. Twenty-eight or 11.2% were worse. These statistics on Tai Foong Chee require careful sifting. Few advanced cases among the Chinese in Sungei Buloh will admit that they are getting worse. In other cases where there is little possibility of ultimate arrest patients naturally prefer the easiest drug. For a number of other reasons the process of wish-fulfilment

seems to influence the patients' views on Tai Foong Chee more than any other drug.

Alepol.—There have been no cases treated with Alepol during the year.

Hospital Patients.—A total of 719 cases were treated in hospital as in-patients for complicating medical and surgical conditions and for the acute phases of leprosy. There were 558 males and 161 females. These numbers give a good idea of how large a percentage of lepers require hospital investigation and treatment at one period or another of their disease.

Septic Conditions .- Of the hospital patients, 209 were admitted for leprotic and trophic ulceration, gangrene necrosis of bone and septicæmia. A regrettable feature in the year's work is that there have been nine deaths among these septic cases. This figure is too high and it will be lowered in 1934. There were sixteen cases of severe nephritis with symptoms of chronic uræmia. Treatment of this condition forms one of the bugbears of leprosy work here. There were 11 deaths. Out of 17 cases of pulmonary tuberculosis, 11 died. A minor outbreak of malaria occurred in January and February with a sharper one in August—26 cases. Figures for previous years are based on calculations made when microscopic diagnosis and the differentiation between malaria and lepra reaction were imperfectly developed. It is not easy to tell, therefore, whether this malaria is likely to be an isolated incident or not. Out of a total of 68 cases during the year, there was one death in the case of an old man with a subtertian infection and coincident nephritis. Every case was treated in hospital and all with one exception (the fatal case) were treated either with atebrin or atebrin and plasmoquine. The results were satisfactory. In 10 cases a mild form of lepra reaction developed a few days after cessation of treatment with atebrin, but this may equally have been caused by the lowering of resistance due to the malaria. We have come to the conclusion, therefore, that leprosy is no contraindication to treatment with atebrin or plasmochine. No effect on leprotic lesions was observed by the exhibition of either of these drugs.

Lepra Reaction.—A total of 197 cases were treated in hospital. Lepra reaction is on the increase here due to the increased treatment which appears to induce this condition. The cases have tended to fall into two main groups : (1) An acute exacerbation of leprosy with the appearance of raised spreading erythematous lesions accompanied by low fever. (2) A febrile eruptive type commencing often with localised nerve pains and going on to fever and a rose spot eruption.

Out-Patients.—A clinic for ambulatory patients within the Settlement has been conducted daily and minor maladies attended to. The clinic has become increasingly popular an average of 10—70 patients attending daily.

Surgical.—Fourteen major operations were performed— 10 amputations, two laparotomies, and two appendectomies. All the amputations were conducted under spinal anæsthesia and there were no untoward effects. We had previously found the administration of a general anæsthetic to be a considerable strain on the metabolism of a leper, and the cases this year are evidence that spinal anæsthesia is the method of choice wherever practicable in a leper settlement. There were 808 minor operations-abscesses, circumcisions, and the like. Besides this there were 4,400 scrapings of ulcers, 3,300 minor operations for removal of dead tissue, and 2,600 for removal of necrotic bone. This makes a formidable total of 11,108 minor surgical events, or over 38 for each working day of the year. The figures give sufficient indication of the amount of time, energy, and surgical material that require to be expended in thwarting the constant tendency to advancing and repulsive open sores. A number of attempts were made during the year to deal with the problem by trying to devise a cheap form of strapping which could remain in position for a week, thus saving the time and material required for seven dressings. Thirty-five cases were dressed with a latex paste, the dressing being retained for five to seven days. The results were promising, but it was found impossible to contrive a paste that was cheap, effective and easy to handle. A further twenty cases were dressed with a solution of resin in spirit with the addition of a little glycerine and zinc oxide. The results were again promising but the paste was still unsatisfactory and in practice exceedingly messy. The production of a cheap, effective waterproof paste would achieve a considerable saving in surgical material. We have found elastoplast and similar preparations expensive and not so effective even as our locally made pastes. When it is remembered that some 300 dressings are done daily the problem from the financial point of view alone is worth investigation.

Deaths.—There were 55 deaths and 44 post-mortems. There were no deaths from leprosy. There were two suicides —both Chinese patients. One was a middle-aged man of weak mentality, the other a schoolboy of about thirteen who was bacteriologically negative and was to have been discharged shortly. To the staff and myself he had appeared to be perfectly happy and I can only conclude that disturbances connected with the onset of puberty were responsible.

Births.—There have been seven births with six deaths. These children have been removed to the General Hospital within ten days of birth. The death-rate is very high, due to an outbreak of green diarrhœa among the children. These children appear to have little or no natural resistance during the first six months of life. I consider it likely, with the increase both in total numbers and in the percentage of early cases, that the birth-rate will increase in the Settlement.

SUMMARY OF MEDICAL AND SURGICAL STATISTICS.

671 patients received full course of intramuscular ethyl esters and another 199 received intradermal injections as well.

393 received courses of Tai Foong Chee.

197 cases of lepra reaction were treated and some original studies of the conditions made.

14 major and 808 minor operations were performed.

The treatment of minor septic conditions forms a very large part of the work in the Settlement.

The death-rate is 36 per mille as compared with 45 per mille for 1932.

EXPERIMENTAL WORK.

(1) Dyes.—The work on aniline dyes has been continued and a number of difficulties overcome. By the beginning of 1933 it had been observed that certain dyes injected intravenously appeared to have an effect on the leprotic process in a percentage of cases. Later observations showed (a) a definite tendency for these cases to relapse, and (b) a lesser relapse rate in those treated with fluorescein. Further experiments seemed to show that different brands of fluorescein varied in their therapeutic effect. A series of cases of lepra reaction showed 20% favourable results with the use of Merck's fluorescein, while a similar series showed over 70% good results with fluorescein made by Gurr & Coy.

An experiment was then made by putting three batches of patients on to injections of fluorescein from Gurr & Coy., British Drug Houses, and Dakin respectively. This experiment failed, however, to show a demonstrable difference in the quality of these samples. We were able, however, through this experiment, to form the following opinions :—

1. That fluorescein given intravenously in 20 c.c. doses of a 2% solution twice weekly seems to have a beneficial effect in about 50% of cases.

- 2. That the treatment appears to be useless in the majority of advanced cases of leprosy.
- 3. That the optimum period of treatment is about six weeks. After that few patients seem to benefit and a number seem to relapse again if treatment is continued.

Following this a number of experiments have been made with fluorescein derivatives, such as eosin and erythrosin. A further series of cases were treated by injections of fluorescein and then exposed to sunlight and a number of others by injections of fluorescein to which other drugs were added-alkalis, acids, calcium, and pot. permanganate. None of these gave any significant indication of a fresh avenue. As fluorescein is an anhydride of resorcin and pythalic acid, a further series of cases were then treated with resorcin. This presented considerable difficulties in actual practice and nothing of clinical promise was obtained. To avoid the toxic effects of resorcin I prepared a dye, resorcin blue, made by heating resorcin with sodium nitrite and purifying the resultant blue solution. This was water soluble and appeared to be well tolerated. patients were given 25 c.c. doses of a 2% solution intravenously for five weeks. At the end of that time no change was found in the lesions and the experiment was stopped.

(2) A series of fifteen cases are now being treated by intravenous injections of phthalic acid, the remaining component of fluorescein. It is too early to form an opinion on the effects of this drug, but so far the effects are of definite interest and justify the continued close observation of these cases.

(3) *Thallium Acetate.*—Eight cases were treated with thallium acetate, four resistant ringworm cases and four for observation of its effects on leprosy. The ringworm results were satisfactory. No change was observed in the leprotic lesions.

(4) *Electric Vibro Massage.*—This has been used throughout the year for the treatment of post-reaction pains and as a means of inunction on special skin cases. It is a popular treatment and seems satisfactory.

(5) Seven cases of herpes were treated with intramuscular injections of cylophyllum oil every second day in 2 c.c. doses. In five of these the pain seemed to be definitely relieved—particularly so in a case of herpes occipitalis with severe pain and tenderness. Cylophyllum oil does not appear to act as a general narcotic and we have not observed any effect on pain of septic origin. Cases of leprosy with neural pain, however, have responded well throughout the year.

(6) A study of the relative prevalence of positive nasal smears has been undertaken. Of 2,000 examinations of which we have accurate records :—

Nose and ear were both positive in 40.8%. ,, ,, ,, negative in 44.8%. Nose was negative, ear positive in 11.3%. Nose was positive, ear negative in 3%.

In 44.8% of cases the diagnosis was purely clinical. In only 3% of early cases was the nasal smear positive. The suggestion is that examinations of nasal smears are much less important than they are generally considered to be.

(7) *Microscopic.*—Viamein modifications of the Zeil Neelsen stain (using a background of $\frac{1}{8}-\frac{1}{4}$). Trypaflavine was tried with 50 positive smears. The lepra bacilli appear the ordinary fuchsin colour but against a yellow background. The method might be useful for demonstrating purposes but otherwise we did not consider it to be of benefit.

(8) Aoki and Aoki's method of distinguishing dead from living bacilli by staining with erythron picric acid and counterstaining with alkaline methylene blue was tried in a number of cases. The difficulty lies in the lack of any control means of telling whether a lepra bacillus is alive or dead. The results were indefinite.

(9) Over 200 differential counts of blood leucocytes have been done mainly in cases of lepra reaction. Lepra reaction is, however, so often accompanied by ulceration and other conditions which would effect leucocyte count that no definite conclusions were drawn.

(10) Defibrinated thick films from the circulating blood of cases of lepra reaction have been examined for lepra bacilli. 321 films have been examined and bacilli found in 51% of cases. These bacilli were quite often inside the large lymphocytes.

(11) Seven guinea-pigs have been inoculated with sputum from doubtful cases of pulmonary tuberculosis. Three guinea-pigs died of tuberculosis. Three other guineapigs have been injected with dyes and other drugs before injecting patients. These three remained healthy.

(12) In the first half of the year an effort was made to estimate the blood fibrinogen in varying stages of leprosy. Twenty-five cases were examined. In practice we found considerable difficulty in getting sharp readings of the precipitates and it was not possible to prove the general impression we obtained—that the blood of an advanced leper clotted more quickly.

(13) The blood of 26 patients was examined for their diastatic enzyme content, and 38 examinations of blood were made in all. Eight advanced cases failed to show an enzyme content—the early cases were positive in varying degrees to diastase. The experiment was, however, inconclusive.

(14) In the leprosy work of other countries throughout the year there has been an increasing interest taken in serological reactions. A number of both lepers and nonlepers were subjected to Mitsuda's skin test. This consists of raising an intradermal weal by the injection of a sterilised vaccine made from a nodule. Early cases and non-lepers are supposed to give a positive reaction, while nodular cases give a negative one. The test, like others of its kind, would only be of value in classification or as an indication of resistance. Thirty non-leper inmates of the Decrepit Settlement were positive (i.e., were not lepers). One of these only became positive after three weeks. As it was perfectly obvious clinically that they were not lepers, the information obtained was not considered to be of great value. Leper controls showed the most varying results which could not be systematised.

(15) Following the work done by Dr. Kingsbury in 1932, a number of reaction cases were treated with injection of autogenous urinary proteose. This proteose is injected intradermally in a single weal in a starting dilution of 1–10,000,000. Ten patients were treated by weekly injections. Two of these developed lepra reaction. A third, a case of asthma, apparently has cleared up completely after two injections. A fourth case of severe and prolonged nerve pains who had been confined to bed for over three months, was greatly relieved after one injection and was able to walk about without pain after the second. The other six were cases of lepra reaction, and showed no definite response. Further work is being done on this.

Syphilis.—A total of 162 cases were given anti-syphilitic treatment. In a previous report it was stated that more and more reliance was being placed in the administration of bismuth owing to the number of cases who were reacting badly to the injection of arsenicals. It has been found this year, however, that the bad effects have disappeared on a rigid revisal of technique. Ambulatory cases have been given normal courses of N.A.B. and Bismustab; hospita cases have, in suitable subjects, been given two injections of N.A.B. weekly, making a total of .9 gram each week with additional injections of Bismuth. These would appear to be very large doses for cases with impairment of skin function, but they are apparently quite well tolerated if a scrupulous technique is followed.

Leprosy of the Eye.—Fourteen cases with leprotic affections of the eyes were treated with Solganol Oleosum. Leprotic iritis appears to respond very well to the treatment. Twelve cases with eye involvement (three iritis and nine with chronic conjunctivitis or with "leprous eye") were treated with subconjunctival injections of 1—1,000 trypan blue. This was done following the work of Muir, who claims very good results. The injection is an unpleasant one. The cases with chronic conjunctivitis appeared to benefit and also a percentage of eye reactions. In a number of cases in each group no improvement was observed.

Administrative.—Conditions within the Settlement continue to be in a very satisfactory state. An English play was prepared by the leper children and performed during the middle of the year before an outside audience of about 100 visitors. This has been our most ambitious social effort so far and was, I think, good propaganda for the attraction of cases to the Settlement. The Settlement magazine, the periodical dramas and cinemas have gone on as usual. The 150 cases discharged have raised a number of problems. These patients are as a rule reluctant to leave the Settlement during the present economic depression. The only patients willing to be discharged are those Indians who have relatives in India or who are unable to realise that there is a slump. Another group are handicapped by physical disabilities which prevent them pulling their economic weight or which suggest leprosy to any prospective employer. In the half-yearly report I quoted a case from this group—the case of a young Chinese woman who was discharged. Her appearance was reasonably attractive except that the fingers of both hands had been lost. She could not, therefore, return to her previous occupation as a dhobie, and the number of professions open to her appear to me to be strictly limited. Such a case, from the nature of her future methods of earning a livelihood, must be prone to relapse and the dissemination of leprosy. Patients are to a much greater extent visualising their stay in the Settlement as a temporary one. A probably unique example is that of a Government Department who sent in a Malay employee during the year under the regulations for local

sick leave. The Settlement is obviously attracting more and more early cases, especially among the Malays and Chinese, and the year has shown increased reason to hope that the machinery of compulsion is steadily becoming a smaller factor in the segregation and treatment of these cases.

Reports.

ANNUAL REPORT, CALCUTTA SCHOOL OF TROPICAL MEDICINE, 1933.

This report is a demonstration of the excellent work which the School of Tropical Medicine is doing, and shows clearly the great contribution which this School is making to our knowledge of tropical medicine. Our chief interest naturally is found in the leprosy section of the report. A *resume* of the various activities of this department is given, as follows :--

Pathology.—"A thorough study of material available has resulted in important findings :—(1) Even in slight cases of leprosy, clinically showing only localised lesions in the skin, there are often leprous lesions with bacilli, in apparently unaffected skin, nerves, glands and internal organs. The disease is thus often much more widespread than it appears. (2) There is in leprosy a marked infection of the reticulo-endothelial system, in fact leprosy appears to be essentially an infection of this system. An interesting comparison can be made between leprosy and dermal leishmaniasis, a disease which sometimes so closely simulates leprosy that only examination for M. lepræ and L. donovani can definitely establish the diagnosis. (3) The nerve lesions and the macules seen in nerve leprosy show a granulomatous change of a peculiar nature with (frequent) giant cell formation. Bacilli, though few, can usually be detected by careful examination."

Bacteriology.—It is interesting to note that so far the work by McKinley and Soule has not yet been confirmed, and it is thought that some modification of tissue culture is perhaps most likely to succeed. Work on the filter passing stage of the bacilli still remains to be proved. As a result of investigation doubt is cast on the bacteriological activity *in vivo* of chaulmoogra preparations. The leprolin test has been carefully investigated, and is reproduced for the benefit of our readers :---" The 'leprolin test' is one which has been used for many years in Japan by Mitsuda, and also more recently by other workers. Material is taken from *leprous* skin containing large numbers of M. lepræ. This is ground up, mixed with saline to a standard strength and sterilised by heat. By preparing in a similar manner a suspension of rat leprosy bacilli, prepared from the liver and spleen of highly infected rats, we obtain a control leprolin. The two suspensions are called respectively Hansen's and Stefansky's leprolin. The test is carried out by intradermal injection of 0.02 c.cm. of each leprolin. Results are read off once a week for six weeks. A positive result is indicated by swelling and induration round the point of puncture, which varies in degree and duration. While in normal healthy adults moderately positive results appear with both leprolins, the reactions with both leprolins are diminished or absent in young children, and in adults in a debilitated condition. In healthy adults with a slight leprous infection the reaction to Hansen's leprolin is increased, while in hyperinfection it is diminished or absent. In both of these the reaction to Stefansky's leprolin is as in non-leprous subjects, provided the general health of the patient is good.

The test is of value in determining the type of the disease, in making a prognosis and in determining the effect of treatment on the patient. Fresh light has been shed on the nature of leprosy and on the interrelationship of the neural and cutaneous types, but much study is yet necessary along these lines."

Clinical and field work is then reviewed and the amount of valuable work done is very extensive. Emphasis is laid on childhood infection. There is a wide field of investigation here and one looks forward to much valuable work in the future along these lines.

ANNUAL REPORT, 1933. INDIAN COUNCIL OF B.E.L.R.A.

This report gives an interesting account of the work of the Indian Council for 1933. It is reported that gradual advance has been made from year to year and the labours of the past years has led the Indian Council to a position of considerable strength and importance in the field of public health in India. Considering the magnitude of the problem, the report emphasises that its existence has been too short to justify looking for visible results, but that such may be seen after a generation has been brought under the influence of its work. It is gratifying to note that the workers of the Association are being received openly by the villagers whom they visit for survey, and that the "leper" is becoming less prone to hide his disease, and there is a general increase of interest in the subject. We congratulate the Indian Council on the magnificent work it has done during the past year. The number of clinics rose from 219 in 1932, to 322 at the end of 1933, and 30,760 new cases were treated. The most encouraging work was seen to be in the district of Salem, where 13 new clinics were established. The report received from Madras states :--- '' In the district of Salem, propaganda and social work among lepers attained remarkable success through the indefatigable efforts of Mrs. Todd and Mr. Curtis. As many as 41 clinics were opened in the district and treatment was given to 4,236 cases every month. A District Leprosy Relief Council to finance all the leprosy clinics was organised by Mrs. Todd. She also formed social committees for each clinic to do social work and impart hygienic education to the villagers, and stimulated the public to subscribe liberally towards the maintenance of the clinics."

Another very interesting piece of work which has been carried out is the survey work in Bengal under the direct supervision of Dr. Muir. We are reprinting in this issue an article from *Leprosy in India*, giving details concerning this work. In Assam, 1,314 cases were detected in a limited area, and in Bengal, apart from provincial survey, 25,895 students in 31 Calcutta schools were examined, and 109 were found to be infected. Similarly, in the Central Provinces, examination of 10,907 students in 175 schools revealed 49 suffering from the disease. In Burma it has been revealed that the incidence of leprosy is twelve times higher than the census rate. The disease has been found to exist in most unexpected quarters, and emphasises the complications of the anti-leprosy campaign.

Two important conferences were held; one in Calcutta, which has already been reported in LEPROSY REVIEW, and the other in Madras.

The report includes reports from various branches of the Association, most of which give very encouraging information, and the whole demonstrates clearly the excellent work that the Indian Council is accomplishing in India. We may well conclude this short reference to the report by quoting a passage concerning its work :—" The work done is a testimony to the awakening of interest in the modern methods of treatment based upon good and tangible results achieved. The leper is slowly beginning to feel that he is not an outcast, that his life is not doomed, but that his disease is curable and that his return to a life of usefulness is not an impossibility. That the Association has been able to play a part in bringing about a ray of hope in the minds of a class of people suffering from age-long depression and distress is a satisfaction, and encourages the Governing Body to take an optimistic view of the future of the Association."

ANNUAL REPORT OF THE DEPARTMENT OF PUBLIC HEALTH OF THE UNION OF SOUTH AFRICA,

for the year ended 30th June, 1934.

It is impossible to refer to the report in general and therefore we are selecting that part which particularly refers to leprosy. Leprosy work in general over the past years is briefly reviewed, and it is pointed out that the disease probably originated in North Africa about 1350 B.C., and in spite of the time that has elapsed and the possibility of its spread by tribal contacts, the report states there is no evidence to show that it had, until the middle of the 18th century, reached the area at present known as the Union of South Africa. Infection was probably introduced into South Africa by slaves brought from the East. The first authentic case was reported in 1756, when two European farmers were diagnosed as suffering from leprosy. Sixty-one years later, the first settlement was started. In 1884 the Leprosy Repression Act was promulgated. It is concluded that absolute segregation must remain the only sound and scientific method of dealing with leprosy in South Africa. It is essential to success that the public be educated to view the disease as one of the endemic diseases of the country. Interesting information concerning the distribu-tion of leprosy in South Africa is given by means of a map, and it is asked why, for example, should some areas have such a high incidence, and why should others have no incidence at all? Are economic conditions, population, recruiting or medical attention responsible for these big differences?

The number of cases of leprosy in the institutions in the Union is given as: European 95, Mixed 102, Asiatic 9, Native 1,951, making a total of 2,157 cases. The number of cases remaining in their own homes is 2,438. Of these 1,542 are still under surveillance, and 889 have been released from surveillance. The total number of known cases in the Union is therefore 4,595.

REPORT ON THE PUBLIC HEALTH OF SOUTHERN RHODESIA, 1933.

The policy adopted by the Government of making their leprosy hospitals resemble voluntary institutions, but without repealing the Leprosy Repression Laws, is meeting with the response anticipated. Large numbers of cases are now coming in of their own accord in the early stage in which the disease lends itself to treatment, and before it has become highly infectious to others; and the fact that the number of cases treated in 1933 was 1,099, or more than double the figure of five years ago, in no sense means that the disease is increasing in the Colony.

These changes are reflected in the number of discharges each year,

most of whom are dismissed without mutilation or scar of any kind. They are subjected to six-monthly re-examinations after leaving the hospital, those showing signs of recrudescence being re-admitted for further treatment.

The two Government leprosy hospitals each treated over 500 cases during the year. The older hospital at Ngomahuru is now well organised and equipped. Mtemwa hospital is in course of development. The Colony acknowledges with gratitude a further donation of $f_{\rm 4}00$ from The British Empire Leprosy Relief Association, for developing this hospital, and states that the existing satisfactory methods of treating leprosy is due to a great extent to the practical help afforded by this Association during the last few years. A smaller leprosy institution is attached to Mnene Mission and is subsidised by the Government, where 54 cases were treated during the year.

It is considered that the present policy of the Government is on right lines, having as its aim the ultimate eradication of the disease as well as the relief of immediate suffering. But its working cannot be fully effective until it is possible to multiply the system of medical units in the native reserves, so as to bring much larger numbers of the indigenous population under medical supervision.

A table is included showing the number of cases treated in 1933 at the three institutions, as 1,099.

Correspondence.

PURULIA LEPER COLONY, 9th July, 1934.

To The Editor, "Leprosy Review," London. DEAR SIR,

In reply to the questions asked by Dr. T. B. Welch, from Wete, Pemba, in the LEPROSY REVIEW for January, 1934, I should like to state that I have carefully gone through the records of my cases whose serum proteins and serum formalin reactions were studied by me in 1930-1931; and I find from a perusal of the records that there is no connection between a strongly positive Kahn and a strongly positive Aldehyde reaction. Cases who have shown a three plus or even a four plus Kahn, have shown a negative Aldehyde reaction, and conversely, cases with a negative or weak Kahn, say one plus (even after repeated testing), have shown a positive reaction with the Aldehyde, of varying degrees. There seems to be no definite relationship between a strongly positive Kahn and a strongly positive Aldehyde reaction.

In this connection, I think it is necessary to mention that in carrying out the Formaldehyde test, it is necessary to have a unit quantity of serum, a unit quantity of formalin of a particular strength, and definite criteria of positivity. The well-known technique of Napier referred to in my article should be followed, as otherwise fallacious results might be obtained. Every serum can be coagulated with sufficiently strong formalin, and if kept for a sufficiently long time. Therefore, to avoid such false positives, it is necessary to follow a well-known technique. With such a technique I could not detect any strongly positive Aldehyde reaction in any uncomplicated case of leprosy.

I remain, Dear Sir,

Yours faithfully,

G. R. RAO.